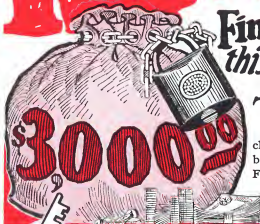


REWARD

Find the key to unlock
this **FREE** Bag of Gold



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THERE are 19 keys pictured here. To be sure, they all look alike, but, examine them closely. 18 of them are exactly alike but **"ONE,"** and only one is DIFFERENT FROM ALL THE OTHERS. It is the key to OPEN THE PADLOCK on this \$3,000.00 FREE "Bag of Gold." **SEE IF YOU CAN FIND IT.**

CLUES

The difference may be in the size, the shape, or even in the notches. So, **STUDY EACH KEY CAREFULLY** and if you can find the **"ONE"** KEY that is different from all the others **SEND THE NUMBER OF IT TO ME AT ONCE.** You may become the winner of a Chrysler "75" Royal Sedan or \$3,000.00 cash money,—without one cent of cost to you. I will give away **ABSOLUTELY FREE**,—3 new six-cylinder 4-door Sedans and the winners can have **CASH MONEY INSTEAD** of the automobiles if they prefer it. **25 BIG PRIZES TO BE GIVEN FREE**—totaling \$7,300.00 cash.

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NO. 2

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AMAZING STORIES

HUGO GERNSBACH
EDITOR



Stories by
Philip Francis Nowlan
A. Hyatt Verrill
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EXPERIMENTER PUBLISHING COMPANY, 230 FIFTH AVENUE, NEW YORK



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PORTRAYING HIS IMMORTALITY

AMAZING STORIES

March, 1929
Vol. 3, No. 12

EDITORIAL & GENERAL OFFICES: 230 Fifth Ave., New York City
Published by Experimenter Publishing Company, Inc.

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PUBLISHERS OF SCIENCE & INVENTION, RADIO NEWS,
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STORIES QUARTERLY, YOUR BODY

Owners of Broadcast Station WRNY

In Our March Issue:

Into the Green Prism

A Serial in 2 parts (Part I)

By A. Hyatt Verrill..... 1064

The Face of Isis

By Cyril G. Waters..... 1084

The Worm

By David H. Keller, M.D..... 1099

The Airlords of Han

(Sequel to "Armageddon—2419")

By Philip Francis Nowlan..... 1106

Our Cover

this month depicts a scene from the story entitled, "The Airlords of Han," by Philip Francis Nowlan, in which the metal sphere radio-piloted by the Americans flies into the room in which Anthony Rogers, Boss of the Wyomings, is held a royal prisoner by the Hans. They locate Rogers by means of their remote control rockets, with which they searched for him for two weeks.

HOW TO SUBSCRIBE TO "AMAZING STORIES." Send your name, address and remittance to Experimenter Publishing Co., 230 Fifth Ave., New York City. Checks and money orders should be made payable to Experimenter Publishing Co., Inc. Specify the name of the magazine you are ordering inasmuch as we also publish RADIO NEWS, SCIENCE & INVENTION, RADIO LISTENERS' GUIDE AND CALL BOOK, AMAZING STORIES QUARTERLY and YOUR BODY. Subscriptions may be made in combination with the other publications just mentioned

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In Our Next Issue:

THE REVOLT OF THE ATOMS, by V. Orlovsky. Like every other new idea, the theory that the energy contained in the atom, if released, would be sufficient to blow the world up, is denied by other scientists. They maintain there is no danger. We cannot tell now, which school of scientists is right, but this tale, which comes to us from Russia, is an excellent story of absorbing interest, not only as a piece of fiction, but for the science contained in it also.

IN THE GREEN PRISM, by A. Hyatt Verrill. A serial in 2 parts (Part II). There can be very little doubt in the minds of those who have read any of Mr. Verrill's stories, that he always has something unusually interesting to tell and that he knows how to tell it. Absorbing as the first instalment was, the concluding paragraphs exceed it by far with the astounding findings which the Indian scientist makes looking through the green prism. Along with its surprise episodes, there is plenty of science in the story.

THE POSTERITY FUND, by Raymond Emery Lawrence. Stories of the far distant future are generally interesting and always compel our attention. This particular tale deals with an unusual subject in the field of scientification—the possible evolution of our present monetary system. You don't need to be an economist to enjoy this ingenious piece of work.

FINGERS OF THE MIST, by Peter Brough. Synthetic life is no novelty in the laboratory any more. Scientists claim to have come pretty close to the secret of life—even if only in the microscopic form thus far. It seems quite possible, even now, that great strides will be made in that science in the near future. At any rate, the idea gives our new author a splendid vehicle for an absorbing story of unusual interest.

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How Dare We Guarantee You a Job and a Raise?

Here is our agreement to take you as you are, supply you with the Electrical training you need, and then get you a fine Electrical position at a substantial increase in salary, or the entire service will not cost you a penny. You may wonder how this is possible. But the explanation is really simple! The Electrical industries are growing so rapidly that the supply of trained men cannot keep up with the demand. There are more good jobs open, always, than men capable of filling them. We are in close touch with many big employers and they tell us they can place all the trained men we can supply.

And because we know all this, and how amazingly Electricity continues to grow into new fields, and because we know the right kind of training equips a man to get and keep a good Electrical job—we have dared to make this guarantee and to back it with our entire resources of over \$2,000,000.00. Get in touch with me, and I'll show you that you can get an Electrical job and a raise—without risking a penny of your money.

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Earn \$35 to \$100 a Week!

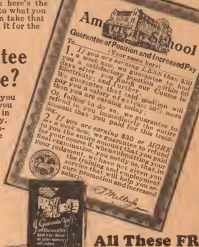
I am looking for ambitious young men who are dissatisfied both with their present pay and future prospects. I want to show them how easily they can get into Electricity—how they can increase their earning capacity and multiply their chances to get ahead many times—simply by switching over to similar work in Electricity. Perhaps you are doing routine office work today in a line where your progress is slow and limited. Then let me show you how you can get one of the many office positions in the Electrical line. And how, with your present business experience, plus a knowledge of Electricity, you can earn a much bigger salary and advance rapidly to highly-paid executive positions. Or if you are a mechanic—wondering how you can avoid remaining a mechanic all your life—I'll tell you how to become first, an Electrical mechanic, and then show you how you'll be in line for quick promotion to Expert, Engineer or Superintendent.

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“I said: ‘Billy, I’m going to give you something worth more than a loan—some good advice—and if you’ll follow it I’ll let you have the hundred too.

“Take up a course with the International Correspondence Schools and put in some of your evenings getting

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“That very night Billy wrote to Scranton, and a few days later he had started studying at home. Why, in a few months he had doubled his salary! Next thing I knew he was put in charge of his department and two months ago they made him Sales Manager. It just shows what a man can do in a little spare time.”

Employers are begging for men with ambition—men who really want to get ahead in the world.

Prove that you are that kind of man! The International Correspondence Schools are

ready and anxious to help you prepare for something better if you will only make the start. Do it now! At least find out all about the I. C. S. and what it can do for you.

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AL. JOHNSON,
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I will show you too how to start a spare time or full time Radio Business of Your Own without capital

Radio's amazing growth is making many big jobs. The world-wide use of receiving sets and the lack of trained men to sell, install and service them has opened many splendid chances for spare time and full time businesses.

Ever so often a new business is started in this country. We have seen how the growth of the automobile industry, electricity and others made men rich. Now Radio is doing the same thing. Its growth has already made many men rich and will make more wealthy in the future. Surely you are not going to pass up this wonderful chance for success.

More Trained Radio Men Needed

A famous Radio expert says there are four good jobs for every man trained to hold them. Radio has grown so fast that it simply has not got the number of trained men it needs. Every year there are hundreds of fine jobs among its many branches such as broadcasting stations, Radio factories, jobbers, dealers, on board ship, commercial land stations, and many others. Many of the six to ten million receiving sets now in use are only 25% to 40% efficient. This has made you big chance for a spare time or full time business of your own selling, installing, repairing sets.

So Many Opportunities You Can Make Extra Money While Learning

Many of our students make \$10, \$20, \$30 a week extra while learning. I'll show you the plans and ideas that have proved successful for them—show you

how to begin making extra money shortly after you enroll. G. W. Page, 1807-21st Ave., S., Nashville, Tenn., made \$935 in his spare time while taking my course.

I Give You Practical Radio Experience With My Course

My course is not just theory. My method gives you practical Radio experience—you learn the "how" and "why" of practically every type of Radio set made. This gives you confidence to tackle any Radio problems and shows up in your pay envelope too.

You can build 100 circuits with the Six Big Outfits of Radio parts I give you. The pictures here show only three of them. My book explains my method of giving practical training at home. Get your copy!

I Will Train You At Home In Your Spare Time

I bring my training to you. Hold your job. Give me only part of your spare time. You don't have to be a college or high school graduate. Many of my graduates now making big money in Radio didn't even finish the grades. Boys 14, 15 years old and men up to 60 have finished my course successfully.

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I will give you a written agreement the day you enroll to refund your money if you are not satisfied with the lessons and instruction service when you complete the course. You are the only judge. The resources of the N. R. I. Pioneer and Largest Home-Study Radio school in the world stand back of this agreement.

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*Based on the combined experiences of F. B. Englehardt, Chattanooga, Tenn., A. F. Thompson, Sioux City, Iowa, B. F. Bolton, Columbus, Ohio, and many others.



Caught in a Rut

I wonder I put up with it as long as I did! Every day was filled with nothing but deadly routine and monotonous detail. No freedom or independence. No chance to get out and meet people, travel, nor have interesting experiences. I was just like a cog in a big machine with poor prospects of ever being anything more.



Long, Tiresome Hours

Every hour of the day I was under somebody's supervision. The TIME-CLOCK constantly laid in wait for me—a monument to unfulfilled hopes and dying ambition. Four times a day, promptly on the dot, it hurried its silent challenge at my self-respect, reminding me how unimportant I was and how little I really COUNTED in the business and social world!



Low Pay

Paid just enough to keep going—but never enough to enjoy any of the GOOD things of life every man DESERVES for his family and himself. Always economizing and pinching pennies. Always wondering what I would do if I were laid off or lost my job. Always uncertain and apprehensive of the future.



Desperate

Happened to get a look at the payroll one day and was astonished to see what big salaries went to the sales force. Found that salesman Brown made \$200 a week—and Jenkins \$275! Would have given my right arm to make money that fast, but never dreamed I had any "gift" for salesmanship.



A Ray of Light

Stumbled across an article on salesmanship in a magazine that evening. Was surprised to discover that salesmen were made and not "born" as I had foolishly believed. Read about a former cowpuncher, Wm. Shore, California, making \$325 in one week after learning the ins-and-outs of scientific salesmanship. Decided that if HE could do it, so could I!



The Turning Point

My first step was to write for a certain little book which a famous business genius has called "The MOST AMAZING BOOK EVER PRINTED". It wasn't a very big book, but it certainly opened my eyes to things I had never dreamed of—and proved the turning point of my entire career!



What I Discovered

Between the pages of this remarkable volume, I discovered hundreds of little known facts and secrets that revealed the REAL TRUTH about the science of selling! It wasn't a bit as I had imagined. I found out that it was governed by simple rules and laws that almost ANY man can master as easily as he learned the alphabet. I even learned how to go about getting into this "highest paid of all professions". I found out exactly how Mark Barichievich of San Francisco was enabled to quit his \$8 a week job as a restaurant-worker and start making \$125 a week as a salesman; and how C. W. Birmingham of Dayton, Ohio, jumped from \$15 a week to \$7500 a year—these and hundreds of others! It certainly was a revelation!



FREE

Employment Service

Furthermore, I discovered that the National Salesmen's Training Association, which published the book, also operates a most effective employment service! Last year they received requests from all over the U. S. and Canada for more than 50,000 salesmen trained by their method. This service is FREE to both members and employers and thousands have secured positions this way!



Making Good At Last!

It didn't take me long to decide to cast my lot with N. S. T. A.—and after a few weeks I had mastered the secrets of Modern Salesmanship during spare time, without losing a day or a dollar from my old job. When I was ready, Mr. Greenlade (the president) found me over a dozen good openings to choose from—and I selected one which paid me over \$70 a week to start!



Was It Worth It?

Today my salary is \$4800 greater than ever before! No more punching time-clocks or worrying over dimes and quarters! NOW my services are in REAL DEMAND with bigger prospects for the future than I ever dared HOPE for back in those days when I was just another "name" on a pay-roll!



Get Your Copy Free

Right now the book—"Modern Salesmanship"—which banished all my fears and troubles and showed me how to get started on the road to success and independence—will be mailed as a gift to any ambitious man, absolutely FREE. And since there is no obligation, why not see for yourself what amazing facts it contains! Just mail the coupon now—for there is no better way in the world to invest a 2-cent stamp! I KNOW!



Mail It Today!

Simply fill this out and mail to the National Salesmen's Training Association, Dept. C-301, N. S. T. A. Bldg., Chicago, Ill. Your free copy of "Modern Salesmanship" will be sent you by return mail.

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N. S. T. A. Building, Chicago, Illinois
Without obligation, please send me a free copy of "Modern Salesmanship."

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Extravagant Fiction Today *Cold Fact To-morrow*

OUR AMAZING STARS

BY HUGO GERNSBACK



AS we progress in our studies of astrophysics and astronomy in general, the marvel of the universe, as a whole, becomes greater and greater. "Familiarity breeds contempt," is a well-known saying and is true of mundane things as well as of things out in the universe. The mere fact that we have always seen the stars in the heavens is responsible for the fact, that they no longer astonish us, as they would if we had never known of their very existence.

Our telescopes show us that there are not millions, but actually billions of stars visible to us. Each of these stars is, as we well know, a sun. Some of these suns are as large as our own sun, and some of them are hundreds and even thousands of times as large.

What is the reason for this tremendous aggregation of suns throughout the visible universe? Of what purpose are they and why are they in existence in the first place? Astronomical calculations repeatedly have proved that these suns are not at all stable as far as their lives are concerned, but that they go through definite cycles, the same as a human being. They are born, grow up, become hotter and hotter as time goes on, and when eventually they reach their maximum, they decline from the blue-white star at the zenith of their stellar life, to yellow, then red, and finally they become dead suns, giving forth no more light.

But the life of the average sun is figured not in thousands, not in millions, but actually in billions upon billions of years, from the birth of the star until its death, when it finally becomes a dark body. Why there should be stars and what their purpose is, we have not, as yet, the slightest conception; perhaps in a thousand years we shall know a great deal more about all of it. We have no conception to-day where the matter comes from that goes into the making of a star, because we do not, as yet, know what matter is, nor how it is created. Nor do we know why such tremendous amounts of matter as contained in a star should congregate in one mass in order to make a future sun. Whether a star is evolved out of a nebula or whether it is slowly built up from particles floating in the universe which, by gravitation attract each other, no one knows. And back of it all, comes the question: where does the original matter come from, if it does float in space, and how is it created and by what forces? About all these things we know nothing to-day, but we are learning and the strange fact is, that we learn more in our laboratories about the stars than by looking through the telescope.

The fact is, that practically every element that we know of can be found here in our own earth and that the same elements are also found in the stars, as is proven by spectrum analysis. This brings us to the curious conclusion, that the thing that we call matter is exactly the same throughout the width and breadth of the entire universe, no matter how far we go. That, in itself, takes a lot of mystery out of the universe, because although millions and millions of miles separate a star from our earth, we know that it is made of the same stuff as our own earth. This, somehow, makes things more reassuring for the scientist.

One of the questions that puzzled scientists for many years was how a sun could go on "burning" at temperatures that range from 4,000 degrees Fahrenheit to 45,000 degrees Fahrenheit without visible shrinking of the star. If, for instance, a star was made of coal, large as it is, it would soon be reduced to ashes. But the curious and most amazing fact is that stars, such as our own sun, for instance, do not burn up at all like a pile of coal or a carload of wood. When coal is burned, for instance, its combustible constituents combine with the oxygen of the air, and if the ashes, the smoke and the gases produced were all collected, they would weigh more than did the original coal; but in a burning star, we have an entirely new phenomenon, namely, THE ENTIRE MASS IS ACTUALLY DISAPPEARING PROGRESSIVELY.

The reason is that the energy is released by transmutation from one element into another. A faint idea of what is going on in a star may be appreciated by the following:

A hydrogen atom weighs 1,008 in comparison to the gas helium whose weight is 4. If a pound of hydrogen were transmuted into helium, .992 pounds would be helium and .008 pounds would be lost as mass and would be transformed into pure energy. This .008 pound of energy, as we may express it, is equivalent to *more than 430 billion horsepower*. It should be noted that we started out only with a single pound of hydrogen, which is capable of giving such a tremendous amount of energy. It now becomes a good deal easier for us to understand why even a comparatively small star, as for instance, our sun, can last for untold ages without wasting away. If figures are substituted for the terms of the foregoing, the mass in our sun were to be changed to energy, it would keep radiating for at least 15,000 billion years, before it finally had expended all of its energy.

INTO *the* GREEN PRISM

By A. Hyatt Verrill

Author of: "Through the Crater's Rim," "The King of the Monkey Men," etc.

CHAPTER I

IT is rather a difficult matter for a scientist to write intelligently and interestingly of a science with which he is not thoroughly familiar, and it is still harder for one who is accustomed to dealing with hard facts and purely scientific truths to record matters which, to those who have never come into contact with them, must appear purely imaginary and highly improbable. Hence it is with the greatest hesitation, and only after long consideration and innumerable urgings from my fellow scientists, that I have decided to relate the truly remarkable story of the astonishing discoveries, and the incredible incidents that resulted therefrom, which were made by my friend, Professor Ramon Amador, while he was associated with me in South America.

As I think the matter over, I feel convinced that Professor Amador without doubt made the most notable and revolutionary discovery in physics which has been made in the last two centuries. Not only did it completely upset many supposed laws and theories which had been held as scientific truths for years, but in addition, it divulged entirely new and undreamed of forces and laws, both in the realm of physics and in optics. I may even go further and state unequivocally that his discovery threw an entirely new light upon our accepted ideas of matter, ether waves, the atomic theory, gravitational force and even life itself. Had it been developed and brought to the attention of the world it might—and unquestionably would—have been of inconceivable benefit to mankind, although, on the other hand, it might have proved a curse.

But, as has been the case with not a few epochal discoveries in the world of science, my friend's discovery was completely lost almost as soon as it was made, and with its loss the world—as we know it—lost one of its most brilliant scientists, and I lost—temporarily at least—a most steadfast, cherished and esteemed friend.

Professor Ramon Amador, as no doubt most of my readers are aware, was a Peruvian by birth, a citizen of the United States by choice, and an inter-

nationally recognized authority on physics and optics. He was a graduate of Santo Domingo and San Marcos Universities in Cuzco and Lima, a Ph.D. of Harvard, a post-graduate of Princeton and Columbia, and he had taken degrees at several European colleges. Being the fortunate possessor of a comfortable income from profitable investments in his native land, he was able to devote all of his time to study and investigations in his chosen line of science, and while he held the chair of Applied Physics at Moulton University, and delivered courses of lectures on physics and optics at numerous seats of learning both in this country and abroad, he steadfastly refused to accept any permanent appointment where he would be tied down to routine work and would not be free to follow his own inclinations and researches.

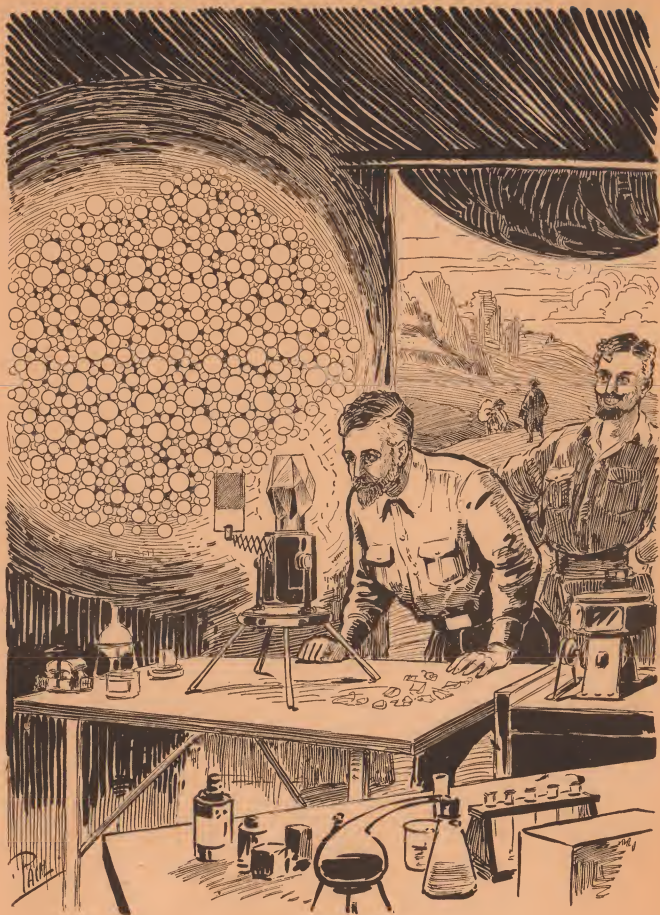
I first met Ramon while I was in Peru conducting archeological studies in and about Cuzco, the ancient Incan capital. Like myself, he was making an intensive study of the cyclopean structures of the pre-Incas, but from an entirely different angle and for a totally distinct purpose. His interest in the ruins of a mysterious vanished race was wholly centered upon the physics and mechanics of the stupendous works, while mine was as equally centered upon the human or anthropological features. Hence our interests never clashed, and from time to time, each of us made discoveries or evolved theories which helped the other, so that we got on famously. But even under any circumstances we would have become steadfast friends.

Amador was a most charming and likable man, once you came to know him well, although to a casual acquaintance he appeared reserved, a bit stand-off-ish—if I may use the term—rather self-sufficient, unemotional, and, at times, even abrupt and discourteous. But these characteristics were due largely to a latent shyness and self-consciousness which he could never quite overcome, and to a subconscious feeling that other men were not in the least interested in him or his work. But, once his friendship and interest were won, he revealed himself as an entirely different character.

His mobile face, usually rather grave and with that indescribable but typical expression of sadness or pathos almost universal among Peruvians, became animated;

THIS is no doubt one of the best works from the pen of Mr. A. Hyatt Verrill. Our well-known South American explorer has quite outdone himself in his present tale. His thoughts strictly along scientific lines are so daring and so revolutionary, that they fairly leave you gasping for breath, and while at first you may not accept the revolutionary ideas, you will find yourself saying after a while—why not? And why should the revelations brought forth by the author not become true in the not too distant future?

The idea of taking a projected image and fixing it so that the image becomes a reality is, at first blush, nothing less than astonishing. Imagine, for instance, a reflection in a mirror suddenly coming to life in its three dimensions. Yet, this is not so foolish as it would appear at first, because you can take an ordinary photographic plate and with nothing but light influencing it, you can get not only a one dimensional, but actually a three dimensional object on this plate, which is simply a transformation of the light impulses into chemical. As a matter of fact, it is possible to make photographic plates with an emulsion so thick, that after treatment, the resulting image fixed on the plate may be a quarter of an inch thick or more, showing all the different gradations in a relief that actually is standing out from the plate.



And yet, as I gazed transfixed, wondering what marvel I was seeing, I noticed that there was no confusion, no variation in the movements of the things; they never collided, never touched, never varied a millionth of an inch from their courses. Ramon was fairly dancing with delight . . .

his lips parted in a delightful boyish smile, his fine eyes sparkled, he talked volubly and entertainingly on almost any subject, and he joked, laughed and related numberless interesting and amusing stories. Possibly his most outstanding characteristics, and those which made him most loved by those who knew him intimately like myself, were his great gentleness, kindness and tenderness; his charity and ability to forgive; his optimism regarding his fellow men and women; his poetic and artistic temperament, and his deep respect—amounting almost to reverence—for women. Unquestionably his Spanish blood was responsible for many of these characteristics, but Incan blood also ran in his veins and accounted for some of his most admirable traits. Although by no means Indian in appearance—for he was no darker than myself, yet at times, he seemed almost wholly Indian in temperament and, despite his scientific training, his devotion to his chosen science and his marvelous powers of deduction and matter-of-fact reasoning, there was a great deal of the aboriginal mysticism, imagination and romance in his makeup.

All this rather lengthy dissertation upon the character of Professor Amador may seem dull, uninteresting and of no real consequence, but it is really highly important, for it throws a light upon subsequent events and, without a knowledge of my dear friend's personality, his actions, his psychology, his final end would seem incredible, unnatural and inexplicable.

DURING the time that we were thrown together at Cuzco—and later at Tiahuanaco in Bolivia—Ramon was a constant source of knowledge and inspiration in my archeological work. Being a native of the country and familiar with the Quichua and Aimará dialects, and with a dash of aboriginal blood besides, he met the native Indians on their own ground, won their confidence and enabled me to secure myths, fables, folk lore and priceless information which they had never before divulged to strangers. Also, these oppressed descendants of the Incans guided us to many hitherto unknown ruins of their ancestors, and while I studied the archeological features of the remains, my friend carried on his measurements and computations, or spent hours, staring at some monolithic structure, a vacant far-away expression in his eyes, as if gazing into the past and visualizing the means by which the forgotten races accomplished feats which were inexplicable to him, even with his knowledge of physical laws. Often, too, his trained eyes and brain noted certain features of the structures which escaped me, and, to my utter amazement, I soon discovered that Professor Amador held most revolutionary and unscientific views regarding the mysterious structures of the district. As he came to know me better, he confessed that he was convinced that the ancient Peruvians and Bolivians had possessed knowledge of forces and of natural laws which are unknown to us and that, if they could be rediscovered, they would revolutionize the industries, arts and even the life of our civilization. Not that he regarded them as supernatural—for despite his Indian-Latin blood, Ramon was utterly lacking in superstition—but, as he

put it quite logically, as the works could not be explained by any known physical laws, and as they could not be duplicated, even with our advanced mechanical knowledge, they must have been accomplished by some unknown method and a knowledge of unknown laws or forces.

It was in hopes of discovering some clue or key to these that he had visited the district, but at the end of several months, when I was compelled to leave for other fields, he confessed that he was no nearer a solution than he was before.

It was not until the following year that I again met Professor Amador. I had recently returned from Ecuador where, in the Manabi district, I had been engaged in making extensive archeological researches, and where I had made some truly epochal discoveries of remains of a hitherto unknown but highly cultured prehistoric race. I had scarcely been able to scratch the surface, so to say, when I had been forced to abandon work owing to the rainy season, and I planned to return to the new field as soon as the weather permitted. But even in the short time I had been on the ground I had obtained some most interesting specimens. Prominent among these were a number of most remarkable gold beads and ornaments unlike anything hitherto known. Viewed with the naked eye, they appeared to be merely grains or tiny nuggets of gold—for which, as a matter of fact, they were mistaken when they were first found—few of them larger than the head of a common pin. During examination under a powerful lens, they were revealed as hand-wrought, perfectly formed beads, chased, carved, decorated and perforated. Many, indeed, were composed of several almost microscopic portions, soldered or welded together.*

The moment I showed these truly amazing examples of prehistoric handiwork to Professor Amador, he became intensely interested and excited.

"Marvelous!" he exclaimed, as he examined the minute golden beads with his pocket lens. "The most astonishing examples of human handicraft I have ever seen. The very antithesis of the stupendous works of the trans-Andean regions! My friend, I believe your discovery of these may lead to the ultimate solution of all the mysteries of physics which I have vainly tried to solve. Think of it! On the one hand structures composed of stones weighing upwards of one hundred tons, cut, fitted, raised to great heights, transported hundreds of miles** squared and bevelled with mathematical accuracy, sculptured elaborately, hewn into immense doorways and portals as though the refractory pyritic rock were as soft as cheese. On the other hand, these minute, almost invisible golden beads, carved, built up, perforated as perfectly, as beautifully as though they were inches in diameter or—perhaps better—as though they had been made by the hands of midgets—elves or

* Such beads were actually found at Manabi, Ecuador, by Prof. Marshall Saville of the Museum of the American Indian, Heye Foundation, and are on exhibition at the museum in New York City.

** In Bolivia and Peru are monolithic stone idols of gigantic size (one measuring fifty feet in length by twelve feet in diameter) which are composed of a rock known only in Ecuador, in a district nearly fifteen hundred miles from where the idols were found.

fairies—no larger than a mouse! There you have the two extremes; and both, I feel sure, are the result of a knowledge of the same lost physical laws. In one case we have normal handiwork exaggerated, enlarged thousands of times; in the other equally normal handiwork reduced in an equal degree. It is"—here he laughed merrily at the comparison—"it is like viewing objects through the opposite ends of a telescope; seemingly magnifying them one way, apparently reducing them the other!" Then, suddenly: "Caramba!" he cried, leaping to his feet and relapsing into his mother tongue as he always did when greatly excited. "That is an idea, an inspiration! My friend, these golden beads must have been fashioned by means of a lens! No human being of normal size could have accomplished the feat otherwise, and we know they are the work of normal sized men, for you tell me the other objects are of ordinary size and that the skeletal fragments you have unearthed are those of ordinary human beings. Ah! we must discover those lenses. Even if I cannot solve the puzzle of the laws and forces that enabled the pre-Incas to cut and erect their titanic structures, still I may make epochal discoveries in the line of optics.

"With your permission, Don Alfeo, I shall accompany you when you return to Esmeraldas. Somewhere in the district we must find the lenses—such things are imperishable—and I am not sure—no, I dare not mention such an insane thought—I am not sure, but that the key to the mysteries may be revealed, when we find those prehistoric magnifying glasses."

THAT my friend had some new theory in his fertile brain, I felt sure. His imagination had been fired, had leaped ahead and had seized upon some clue or detail or some feature that had escaped me, and had visualized some possible solution of the puzzles he had so long been trying to solve. Personally I could see no connection between the cyclopean stone work of the interior and these minute gold objects from the coast. They were as far apart as the antipodes, the work of two distinct races, objects of totally different materials, and, for all I or anyone else knew, of different periods—perhaps hundreds, even thousands of years apart. Archeologically and anthropologically the beads were most interesting as revealing new features of a cultural center, and while they had aroused my wonder and interest, yet how they were made was a problem that, strictly speaking, was scarcely an archeological matter. The thought had crossed my mind that the makers of the beads must have possessed most remarkable eyesight and extraordinarily deft and delicate fingers, and for a moment I, too, had wondered, if by any possibility, they had possessed lenses of some sort. But, as far as known, no prehistoric American race had even a remote or rudimentary knowledge of optics, and I dismissed the idea as unreasonable, fanciful and outside the realm of scientific reasoning. I had seen living Indians—such as the Mapuches of Chile—weave horsehair into extremely small forms. I had seen purlind squaws of the Pima tribe weave nests of perfectly-formed baskets, the largest barely an inch in diameter and the smallest scarcely a quarter of an inch square, and I deemed it not

at all impossible that the ancient inhabitants of Manabi might have carved and soldered grains of gold with the unaided eye, even if a white man, with the degenerate eyesight resulting from centuries of civilization, artificial light and lack of training, would have found such a feat utterly impossible.

But Amador, as I have said, possessed a vivid imagination, a love of the mysterious and mystical, a vast amount of romance, and, as was quite natural, even necessary I might say, considering the science to which he was devoted, he was a trained, expert theorist. Here I might fittingly explain that there is a very wide gulf between the two sciences we represented. Archeology and anthropology are sciences built upon facts. The archeologist—and the anthropologist—make discoveries, reveal uncontroversial facts, and from the material and data obtained, formulate theories and hypotheses to dovetail with the facts. The physicist, on the contrary, works out abstract theories, formulates problematical laws and mathematical equations, and, from these, endeavors to prove facts and to demonstrate the accuracy of his calculations. Amador, to be sure, was not entirely a theoretical scientist, but realized that, in many cases, facts should come first and theories later. In fact I had often jokingly told him that the world had lost a most brilliant archeologist, when he had turned to physics as a life study, for his remarkable powers of observation, his interest in his prehistoric ancestors, and his powers of deduction would have enabled him to have reached the topmost pinnacle in that science.

But to return to more concrete matters. Ramon, of course, accompanied me a few months later, when I set sail for South America, and, in due course of time, we found ourselves in Ecuador.

I had thought that my own equipment was very complete and, much as I regretted it, far too bulky and voluminous for traveling in a crude and somewhat wild district. But in comparison with the impedimenta of my friend, my luggage was insignificant. Not only did he carry a most complete and up-to-date field equipment, consisting of the latest of tents, camp furniture, cooking outfit, etc., together with clothing, arms, food supplies and enough to supply a large party for months of tropical exploration, but in addition, he had brought along a most elaborate scientific laboratory, with a complete chemical and mechanical plant for conducting tests and experiments in optics and physics.

I gazed with dismay upon the innumerable boxes, cases, bundles, baskets, trunks, bags and other packages bearing Amador's name, which were disgorged from the steamer's hold and were dropped upon the rickety dock at Guayaquil.

And I foresaw no little difficulty in transporting this mountain of dunnage up the coast to the jungle-covered shores of the river at Manabi.

But I had reckoned without my friend's resourcefulness and familiarity with local conditions. I had prided myself upon my experience and knowledge of Latin America and Latin Americans, upon my ability to accomplish great things when dealing with the natives; but, beside Ramon, I was a veritable amateur. Browbeating, joking, cajoling, flattering, cursing, praising

the tattered Mestizo peons, the uniformed officials, the slouching stevedores, the sailors and the innumerable hangers-on by turn, he soon had them laughing, working like demons, obeying him instantly, vying with one another to please him, and, in an incredibly short time, all our baggage was stowed in the dirty coasting schooner and we were ready for the long and weary voyage up the coast.

CHAPTER II

WE reached our destination in due time and, having arrived at the location where I had secured the specimens the preceding season, and had done my excavatory work, Professor Amador's laboratory and outfit were soon unpacked and set up, forming quite an imposing nucleus of civilization in the midst of the wilderness. Meanwhile, I had arranged my own much humbler and simpler headquarters, had set my men to work clearing the jungle that had sprung up like magic since my last visit, and busied myself searching for the most promising spot in which to recommence my field work.

Ramon, once he had established himself, donned old bush clothes, fell to work with the rest of us, and soon proved himself as adaptable to roughing it as any old hand. He showed the most intense interest in the locality, asked innumerable questions, watched everything I did, and in an astonishingly short time acquired a remarkable knowledge of archeological work. He possessed the keenest eyes of any man I ever met, and was most amazingly observant. Several times he discovered valuable and interesting specimens, which I had completely overlooked. As the excavations proceeded, he watched each shovelful of earth like a hawk, and would swoop upon every fragment of potsherd or chipped stone that was revealed. The spot where we were working was on a fairly level, alluvial plain between two streams—a sort of tongue or cape which obviously had frequently been flooded in times past. That it had also been occupied by a populous village or town was evident, for all along the steep river banks, pots, herds, stone implements and remains of fires were to be seen. Evidently, too, the site had been occupied for a long time, for the traces of human occupancy extended from a few feet below the surface to a depth of more than twenty feet. And as the soil was literally filled with potsherds, digging was slow work. Each time a fragment of pottery was disclosed it was necessary to proceed very carefully; often we worked for hours with a small trowel and a whisk broom in order to secure some fragment without completely destroying it. And as we found no traces of gold ornaments and no traces of any material which might have served as a lens, after several days' work, Professor Amador grew tired of watching the apparently fruitless labors of the peons and wandered off up the narrow, pebbly beach beside the stream. It was in the stream itself that I had discovered the minute gold beads, and knowing they must have been washed out from the banks, I had assumed that they had come from the village site. Armed with a *batea* or gold pan, Ramon busied himself washing out the gravel in the stream and grew quite

excited and enthusiastic when he, too, secured several dozen of the beads. But he was interested only in finding the means by which the ancient Manabis had fashioned the bits of ornamented gold, and when, on the second day of his panning, he shouted lustily to me, I felt sure he had made a discovery. I was not mistaken. From the river gravel he had washed out a fragment of semi-transparent green material which, had I come upon it, I should have cast aside as a bit of a green glass bottle, the remains of one of my own discarded bottles of the previous season. But Ramon, who was busily examining the fragment with his pocket-lens, declared that it was not glass.

"Hmm, perhaps an emerald," I suggested, half-jokingly.

"No, it is not beryl,"* he replied, his eyes still squinting through his glass. "It is exceedingly light—much lighter than aluminum, I should judge. But," with a deep sigh of disappointment, "it is far too small to be of any use."

I laughed. "What use did you hope to put it to?" I asked.

He looked up, a surprised expression in his fine eyes. "Use?" he repeated. "Why to experiment with, to be sure! This might prove to be the material these prehistoric people used for making lenses. It would be almost perfectly transparent—if it were not roughened and worn by the action of water and sand."

I could not refrain from smiling incredulously. "Hardly," I declared. "I do not think that even primitive man would select material of that color when there is plenty of clear transparent quartz in the country hereabout. No, Ramon, if these people ever did use lenses, I'll wager they made them from transparent quartz."

"No use arguing," he said with finality in his tones. "But somehow, by some sort of premonition or hunch or something, I have felt all along that we are going to make an epochal discovery here. Perhaps that is why I am over elated and interested at everything unusual. And this bit of green mineral is unusual. I wonder whence it came."

Leaving him still pondering on this matter, I returned to my peons, who, the instant my back was turned, had promptly quit working.

BUSY at the excavatory work, I thought nothing more of my friend and his bit of green mineral, until the men stopped work at noon and I went to my lunch and found the Professor had not returned. Even then I was not troubled for I assumed Ramon was still busy washing out gravel and searching for fragments of the green stone. I sent Louis, our camp-boy, to summon him, and went ahead with my midday meal. When Louis returned and stated that he could not find Ramon, I did become a bit anxious. In fact I was about to start off to search for him myself, when he appeared, arriving from the opposite direction from which he had been going when I had last seen him.

"You may be an expert archeologist," he announced with a grin, as he came into camp, "but you've made

* Beryl is the mineral, specially fine samples of which are called emeralds.

a great mistake in wasting time digging here. What do you think of this?"

As he spoke, he reached in his haversack and produced a beautifully sculptured figurine of lapis-lazuli.

I was speechless with surprise. It was the most perfect piece of prehistoric American stone-carving I had ever seen. It was far superior to any Maya, Aztec or Inca work; a human figure about ten inches in height and showing a squatting man, his hands resting on his knees, his head topped by an elaborate headdress of unique design.

"Where on earth did you find this?" I cried at last.

He chuckled as he helped himself to the food Louis set before him. "Up the stream a way," he replied as he gnawed at a wild turkey's leg. "I suggest," he continued, "that we move to the spot after lunch, and abandon this wasteful digging of broken cook-pots. The locality where I secured the little idol is the spot whence the gold beads came. There are quite extensive ruins there. I found a number of stone columns projecting above the earth and sticking out of the bank, and I picked up the little blue god from where he had tumbled down to the beach. I do not claim to know anything about your line of work, *amigo mio*, but if I am not mistaken, the place I found was a temple or something of the sort. It seems to me that there we will have a much greater chance of coming upon the key to the puzzle—perhaps the very lenses these people used. And," he added as if in afterthought—"if you will examine the little god with your pocket-lens, you will discover that the apparently uniformly smooth surface of the stone is completely covered with intricate carving, invisible to the unaided eye."

Ramon was right. To my utter amazement, I found that the most beautiful and delicate ornamental pattern had been deeply engraved over the surface of the lapis lazuli, although, to my naked eye, the surface seemed scarcely roughened. It was even more astonishing than the almost microscopic gold beads. I could not imagine any human being with eyes and touch, that would enable him to carve the refractory stone in this manner, even had he possessed a lens.

But the indisputable proof was before me, and, I plied Ramon with queries about the new site he had so fortunately discovered. He could add but little to the meagre information he had already given. But from that little I was convinced that the new site was most promising and, lunch over, orders were given to break camp and move upstream. This was slow work and the sun had set in a blaze of glory behind the palm trees in the west before our camps, Ramon's laboratory and equipment and all our paraphernalia had been moved to a delightfully situated spot on a low hill above the river some five miles from our first location.

My friend had not exaggerated. Rather, he had understated the importance of his discovery. Everywhere, over an extensive area, there were the extremities of great stone columns projecting above the earth; some were plain, others sculptured, and as we cleared the jungle away, we came upon numerous masses of cut and sculptured stone, and not a few monolithic stone images or idols.

As Professor Amador had thought, the place had obviously been used as a great temple or place for ceremonials, and here, if anywhere, we might expect to come upon archeological treasures and—I might add—the means by which the ancient occupants had manufactured their microscopic beads and engraved their invisible designs on stone.

I would like to describe in detail the progress of our work, the finds we made, the remarkable artifacts we secured. But that has no place in this record of Professor Amador's discovery and disappearance. Suffice to say that we had stumbled upon an archeological treasure-house, the very nucleus of the prehistoric civilization of the Manabis, and daily, as my work proceeded and my specimens accumulated, matters which hitherto had been puzzling and mysterious were explained. The strange carved stone seats typical of this culture were numerous and of all sizes; stone idols and the remarkable carved stone slabs described by Saville were innumerable; we came upon countless numbers of the peculiar elliptical, beautifully-wrought pottery vessels known only from this culture, and, in addition to these objects already well-known to science, we secured priceless specimens in the form of wrought and carved beads, ornaments and figures in precious and semi-precious stones. Agate, carnelian, jade, lapis-lazuli, malachite, quartz, garnet, amethyst, beryl, topaz—even a few emeralds and sapphires had been cut, perforated, polished and covered with microscopic engraving by the Manabis, and, judging from their abundance, with almost as little effort as though the refractory minerals had been so much soft limestone. Also, and most interesting of all to me, were many objects of copper and silver plated with gold. How the ancient artisans coated the baser metals with gold was a mystery, and Ramon was almost as deeply interested in solving this riddle as in his quest for his theoretical lens. In his search for this he was tireless. From the very commencement we had found the microscopic gold beads, as well as others equally small, made from the hardest stones, and in several instances we had found hundreds and thousands of these cached in pottery vessels. I truly believe that Amador averaged less than an hour's sleep a night for weeks. At the close of the day's work he would go to his laboratory, and throughout the night, would devote himself to making intensive studies and working out long and involved calculations based upon the beautiful specimens of miniature handiwork we had obtained. His idea, as he explained it, was to determine how great a magnification the artisans must have secured in order to have engraved and perforated the objects by hand.

"If I can determine that point," he declared. "I will know whether they had any knowledge of advanced or rudimentary optics, and, possibly, I may be able to establish the type of lens they used and even the material from which it was made. Given the magnification it is not impossible to work out the size, curvature, and other details of a lens."

I MUST confess, it seemed a hopeless waste of time and energy, from my point of view. If the Manabis

ever used lenses, then, I felt sure, we would find them eventually. And if they did not, then all of my friend's labors would have been for nothing. I am afraid I have little patience—or rather I should say, I *had* little at that time—with abstract theories based wholly upon assumptions. Had we found a lens I could have well understood Ramon wishing to work out its details and properties, but I could not understand his point in determining details of a lens which very possibly, in fact probably, had never existed. But that was Professor Amador's affair, not mine, and I suppose he saw just as little use in my accumulating thousands of specimens and in my endeavoring to reconstruct the lives, customs, religion and what-not of a long extinct race of fellow men and women.

Then, one morning, he appeared with an elated, triumphant expression on his face.

"I have made a great discovery," he announced. "I have completed my calculations and I am convinced that the lens—or apparatus—used by these people was totally different from anything known to modern optics or physics. No known material and no known form of lens would magnify an article sufficiently to enable a human being to execute work as minute as we have found."

"Hmm," I muttered, "I cannot see, my friend, how that helps matters—even if you are right. Unless you can ascertain *what* they used—if they used anything—you haven't come any nearer solving your problem. And I admit I *am* a bit skeptical. How can you be sure that it is not possible to grind a glass or quartz lens to magnify to any desired extent? We have microscope objectives that will magnify hundreds-thousands of diameters."

Ramon smiled. "You forget, *amigo mío*, that such high-powered objectives have an exceedingly short focus. Your knowledge of optical laws are, I fear, very rudimentary. The greater the magnification, the shorter the focal length, or to reverse the equation and to point out the truth of my argument, the closer the lens must be to the object to be magnified. My calculations prove beyond the shadow of a doubt that, to enable human beings to incise the carved designs upon these precious-stone objects, the surface must have been magnified at least two hundred and fifty diameters. Now, my good friend, any known form of lens that is capable of a magnification of that amount would have a field of less than one-eighth of an inch diameter—approximately three millimeters. In order to focus such a lens sharply, it would have to be placed within one one-hundredth of an inch of the surface to be magnified—in fact it would have to be an oil-immersion lens—and hence it would be absolutely impossible for any human being to use a tool between the lens and the surface upon which it was focussed. And," he added with finality, "even assuming that a lens *could* be made to fulfill the requirements of the case, you must remember that the tip or edge of the tool used in cutting the stone or metal would be equally magnified and would appear gigantic and coarse. It would in fact be somewhat similar to using a pickaxe for engraving a copper plate for a visiting card."

There was nothing I could say in rebuttal. If his statements were correct, and I knew him far too well to question them, then it would seem that his deductions were logical. I was accustomed to using a microscope myself, and although in my work I had never been obliged to resort to very high powers, still, when I came to think of it, I remembered that even a comparatively low power objective *did* have a short focus and a small field and had to be most carefully adjusted to within a very short distance of the object being examined. And I also remembered that I had been warned by my biology professor at college to use great care not to crack the microscope slides by screwing the lens against them. Ramon, then, must be right, at least in some of his conclusions. But, to my mind, he was still working on false or at least unsubstantiated premises.

"Even so," I objected at last, "it isn't necessary to assume that the Manabis possessed lenses of unknown material or design. Their eyes may have been different from ours, or"—I added half-banteringly—"they may have possessed some mechanical device, some machine that would produce the results that are so mystifying. We have machinery that can engrave steel and other materials in much finer designs than any of those we have found here."

"You are straining at a gnat and swallowing a camel," laughed Ramon. "You are perfectly aware that the prehistoric races had no knowledge of mechanics, no knowledge whatever of the wheel, without which mechanical devices are quite impossible. You simply do not wish to admit that pure out-and-out theories can be right, that mathematical problems can solve matters of which we have no true knowledge, or that anything can be assumed to have existed unless concrete evidences of its existence are found."

"But," he finished confidently, "I am convinced that before you have completed excavations here, you *will* find such concrete evidences and that when they are found, they will bear out my theories and my calculations."

A FEW days later he again mentioned the matter. This time, he admitted he was merely theorizing. "I have been thinking deeply on this matter," he announced as we breakfasted together. "And I have almost come to the conclusion that there is some connection between the minute beads and microscopic carving and the gold-plated objects. I might even go farther and state that in the back of my mind is a feeling that there is a direct connection between all these and the titanic stone work of the Andean regions. You may recollect that, when I first saw the gold beads, I remarked that they and the pre-Incan stone work were like looking at objects through the two ends of a telescope. Is it beyond the bounds of possibility that the same means these Manabis used for executing work that is invisible to the unaided eye, might not have been reversed to enable the pre-Incans to perform work which seemingly is that of giants?"

I laughed outright. "My dear Ramon," I cried, "how would visually reducing a fifty-ton stone affect its

physical properties? It would still remain a huge rock and would still weigh fifty tons, even if, to the eye of the observer through 'the wrong end of the telescope,' as you put it, it appeared an insignificant pebble? You might as well suggest that the stones were really small and after being cut and placed were treated by some sort of magic which caused them to expand and remain enlarged, or that these gold beads were cut and made and chased when a foot or two in diameter, and were then—by some occult means—reduced to their present size. No, no, Ramon, I admit the possibility, though not the probability, of a lens having been used—though it was probably a crude, accidentally-made flake of quartz crystal—but I cannot admit, even for the sake of argument, that the prehistoric Americans possessed the power of altering the proportions of non-organic matter."

Professor Amador merely smiled. "Ten, twenty, fifty years ago, that might have been conceded," he replied thoughtfully. "But today we know of a certainty that non-organic matter—and organic as well—is not the fixed, solid unalterable material our ancestors assumed it to be. All matter, as you are well aware; everything, ourselves included, is composed of protons and electrons; independent bodies, movable, transferable, changeable. Certain combinations or groupings of protons and electrons produce certain effects. Such groupings may remain unchanged indefinitely or they may change constantly. A rock may remain unaltered for countless centuries or, under other conditions, it may completely vanish as a rock in a short time. Why? You say by erosion, by weathering, by some one cause or another. Very true. But it is the alteration of the electronic grouping that causes the rock to vanish even though the weather or the elements may produce or incite the electronic alterations. A seed sprouts and grows into a tree. Why? Because the atoms which its molecules contain, alter their arrangement and numbers; air, water and sun and their own vitality cause them to change. We can take a huge mass of wood, of leather, of metal, and reduce it to a fraction of its former size and it will remain reduced, merely because we have forced its component atoms to assume a different combination. If we wish, we can increase material in the same manner. It all depends upon the groupings of electrons and upon vibratory waves. What happens when the tobacco in the pipe you are smoking is burned? Do you, a scientist, mean to tell me that the tobacco has actually been destroyed, that by puffing at your pipe you have eliminated a portion of the matter of the universe? No, you have merely altered an electronic combination. Your tobacco still exists though in changed form. You have produced ash, gases, smoke, liquids, solids, by forcing, through the medium of fire and air, the protons and electrons of the original tobacco to assume new combinations and forms. Even the human body and the bodies of animals of all kinds are in the same sense indestructible. Upon death the electronic combinations and vibratory waves, which give us our living bodies, become altered. By degrees they take on new and unrecognizable forms. Some become gases, others solids, others liquids, and in time

these change still more. They become loam, plants, vegetables. Again they alter and become component parts of new creatures, even of other men and women. For all we know, even our mentality, our spirits or souls, are merely forms of electronic or vibratory wave energy; for all we know these same forms of energy may, either rarely or commonly, reassume their former combinations and produce reincarnated beings having the same thoughts, the same ideals, the same reactions, the same loves and hates as those who died hundreds or thousands of years ago. In the light of present-day science, nothing is impossible, *amigo mio*. What seems impossible or at least highly improbable today may be commonplace tomorrow. Is it any more remarkable to imagine a small pebble increased to a gigantic monolith, or to think of a life-sized statue reduced to miniature, than to conceive of the human voice—the living, speaking image of a human being—being transmitted through the empty air for hundreds, thousands of miles? Mind you, I do not say positively that these prehistoric people possessed some power, unknown to us, of permanently altering the proportions of objects. But we must admit, or else discredit the testimony of our five senses, that they possessed some knowledge of which we are woefully ignorant. And I should not be at all surprised if, when we hit upon the secret, we will find that it was along the lines I have suggested."

"Whew!" I exclaimed. "No wonder you hold the reputation of being the most forceful lecturer on physics in the world. Yes, I admit all that you say is incontrovertible truth as admitted by science. In fact, I might add quite a few facts and examples in proof of it. But it doesn't prove anything, and until you can either discover this lost wizardry or can work out a theory which can be proved by repeating the magic, you are no nearer a solution of the puzzle. And," I added, as I rose to start my peons at their digging, "I suppose you suggest that the copper objects were plated with gold by the Manabis' ability to transform a portion of the copper to gold by some unknown and lost power that would have made the ancient alchemists green with envy."

CHAPTER III

IT was only a few days later that we came upon a great find, the find that Professor Amador had hoped for and had foreseen, and which was the direct cause of all the truly amazing and incredible events that followed, and which culminated with the disappearance of my friend.

The "find" itself seemed insignificant. Merely a number of fragments of the same transparent greenish mineral, such as Professor Amador had found in the bed of the stream weeks before. But to him the bits of green material—scarcely one of which was half an inch in diameter—were far more precious than emeralds. The instant the first piece was revealed, he leaped into the pit, shoed away the amused peons, and on hands and knees, began searching for fragments. Not until every shovelfull of earth had been carefully sifted and no more pieces of the mineral could be found, did he cease. The result of his labors was a handful of the

green slivers, but he was as excited and enthusiastic as though he had discovered a living Manabi, and he hurried to his laboratory with his treasure-trove.

In the course of the day we came upon several more deposits of similar fragments, and wishing to further my friend's work as much as possible, I had all the fragments in each separate lot carefully preserved and kept together. I did not see Ramon until the following day, but a light was burning in his field laboratory all night, and he admitted that he had not slept. But he had a body and nerves of steel and seemed never to tire, never to be exhausted, never to be in need of sleep, so I had long before given up warning him of the danger of not sleeping enough.

This morning he was jubilant. "I was right!" he exclaimed. "These people *did* use lenses, and lenses of a material hitherto unknown—of that green mineral substance. Although," he qualified, "I am convinced it is an artificial material, not a natural mineral formation."

"Good!" I applauded. "I suppose you have reconstructed a lens and have discovered that it is not so very remarkable and that it will magnify enough to solve the mystery."

"Yes, and no," he declared. "After no little trouble and perseverance, I matched up enough of the fragmentary remains to establish the fact that they were shattered splinters of what was once a lens. The rounded surfaces and the obvious indications of grinding and polishing amply prove that fact. But it would be impossible to reconstruct a lens from the splinters I have. And even if they *were* cemented together, the resultant lens would be worthless in as far as testing its optical peculiarities is concerned. But I shall endeavor to make an exhaustive test to establish the refractive index of the mineral or material, and shall sacrifice a small quantity of it—always of course with your permission—in an effort to melt it. If I succeed, I may try to recast the material and manufacture a new lens."

"You can use all of the stuff you want in any way you see fit," I assured him. "We found a lot more after you left yesterday—I should say we have eight or ten pounds of it now. So go ahead and I wish you every success. But I shall not be convinced until you have made a lens and have proved your case. You see, Ramon, in this case I am from Missouri, as the saying is. The fragments may have rounded surfaces, they may have been cut and polished, but I'll wager they are portions of some ornament, some vessel or some ceremonial object, and not parts of any lens. Why should they be broken? Why should a lens have been shattered—or rather, why should half a dozen lenses have been shattered?"

"Humph!" he snorted. "Why should a dish, an ornament, a ceremonial object—or several of them—have been shattered? Answer that, *amigo mio*, and I will answer your question."

"That's easy," I assured him. "Every archeologist—and most ethnologists—who have studied American aboriginal races, know that it was and is a widespread custom of the Indians to 'kill' their most prized pos-

sessions upon certain occasions. During funerals it is often done, at the dedication of temples the custom is followed, and it also forms a portion of the religious ceremonies of some tribes. There are abundant evidences that the Manabis practised the custom. Many of the broken stone artifacts—the *metates** and chairs, the idols—as well as much of the pottery I have found, were obviously broken intentionally. I have secured several pots shattered by stones which still remain among the fragments; I have found others resting against the stone columns with smears of their color showing where they were dashed against the stone. The Indians' idea is that by 'killing,' or as we would say sacrificing, an article they prevent evil spirits or devils from taking possession of it. And, as a usual thing, the objects most commonly sacrificed are those of a ceremonial character. If you had observed, you would have noticed that, in every case, the plain pottery and ordinary stone artifacts in this site are entire, whereas the objects of a ceremonial or symbolic type have been intentionally broken. Now if these people had very sacred ceremonial objects composed of your green glass or whatever it is, they would be the first to be sacrificed."

"I take off my hat to you as a lecturer," he laughed. "Thanks for the scientific and highly interesting information. But, let me point out, your explanation answers your own question. Admitting all you say is so, then if these Manabis possessed lenses, they unquestionably would have looked upon them as sacred or mysterious or ceremonial, and they too, would have been sacrificed."

I WAS floored. His argument was logical. Still I was not convinced and I told him so. But he pointed out that not one of the fragments was so shaped that it could have formed a portion of any dish, figure or ornament, and he insisted that the splinters represented some form of lenses.

"If we could only discover the site whence the material was obtained," he remarked, "we might be able to construct a lens and prove my theory."

"But I thought you said you believed the material an artificial product," I reminded him. "Surely, if that is so, you should be able to analyze it and reproduce it. You are an excellent inorganic chemist, I know, and you have a very complete chemical laboratory with you."

"My very dear, good friend," he ejaculated, "chemistry is a most remarkable and exact science to be sure. It will be comparatively easy to analyze the material; but it is an entirely different matter to imitate it. It may prove to be possible as you suggest, but it is just as liable to be utterly impossible. Many materials may be analyzed but not duplicated. And some cannot even be analyzed. Take Bakelite, for example. It is, as you know, a material made by combining formaldehyde and carboic acid with some filler and coloring matter added. And yet, if some man, say a few thousand years from now, should discover a slab of Bakelite and should try

*A curved or hollowed stone used by the Indians in grinding corn. It was a sort of basin in shape.

to determine its way of manufacture by analysis, he would find it absolutely impossible. And I could name a hundred—yes fully one thousand—well-known and common substances which, though readily analyzed and their various component parts identified, cannot be duplicated unless the secret of their manufacture is known. We can analyze diamonds, granite, mica, innumerable minerals, but we cannot make identical substances artificially, and while I do not mean to state positively that I may not be able to produce material identical with this green mineral-like substance, I am not counting much upon being able to do so. As regards my suggestion that it is artificial, I assume that if that is the case, the Manabis discovered the secret of its manufacture by accident—perhaps by building a fire where its various elements occurred, and fusing them together, just as the ancients discovered how to make glass by kindling a fire on a sandy shore where blocks of crude soda surrounded the fire. And if we could find the spot, we should probably find the crude material, for I should imagine that the aborigines, probably regarding the material as sacred or of divine origin, would invariably have sought the same spot when they desired the composition, never realizing that the various elements could be transported elsewhere and then combined."

"Perhaps you are right," I admitted. "But to find the spot would be like searching the proverbial haystack for the equally proverbial needle. It may be within a few yards of where we stand, and then again it may be anywhere within a radius of several thousand miles. You must remember, Ramon, that the Indians——"

"Yes, I know what you are about to say," he interrupted. "That the aborigines transported articles for immense distances, that they bartered and traded from ocean to ocean and from the Arctic to the Antarctic. I am quite aware of that, my friend. I have often examined those mysterious monolithic idols that are abandoned near Lake Titicaca, but are made from stone that, as far as is known, can be found only near Quito in Ecuador—nearly two thousand miles distant. That, *amigo mio*, is one of the puzzles in prehistoric physics, which I have tried and am still trying to solve. But in this case I doubt if the deposits of materials I seek are far from here. Your own and Saville's investigations have demonstrated that the Manabis were restricted to a comparatively small area, that savage, uncivilized tribes surrounded them, and hence they were, in a large measure, self-contained. Yes, unless they received the materials by water, the deposit is close at hand, and I intend to search diligently for it. Can I borrow one of your peons to accompany me on my search?"

Of course, I gladly gave the permission, and for the days following, Ramon made trips into the surrounding jungle, covering an allotted and predetermined area each day, and carefully searching every foot of the ground in his hopeless and, to me, endless quest.

BUT Ramon had the perseverance, the dogged determination or instinct of the Indians, whose blood ran in his veins, and he seemed never discouraged nor

downcast by his constant failures. I must also add that he had tried in vain to analyze the green material. He learned that it contained certain well-known elements—such as silica, aluminum and sodium, but it also contained several elements and the oxide of at least two metals, which baffled all his attempts at identification. I must also add that we had found several more fragments of the material, and these, being larger than those discovered hitherto, were a great puzzle to my friend. Like the others, they showed signs of having been cut and polished, but Ramon's careful and painstaking measurements convinced him that the cut surfaces had not and could not have formed a curved, lens-like surface.

Of course, I teased him when he admitted this, arguing that my theory, that the fragments were the remains of some ceremonial object, was correct, and asking him how he could longer argue that the green substance had been used as a lens, if his own calculations and tests proved it had not been made into a lens form. Ramon, however, could be as non-committal as a full-blooded aborigine. He merely grunted and refused to reply or to suggest any information, but I knew, from his preoccupied manner and his expression, that he had formulated some theory, and that his active and most brilliant brain was busy searching this theory for possible flaws.

It must not be thought by my readers that I belittled Professor Amador's theories, his knowledge of his special branches of science. On the contrary, I admired him intensely. I had the deepest respect for his knowledge, his attainments and his mastery of what are perhaps the most abstruse and difficult of the recognized sciences. But as I have said, we were most intimate friends; we could argue and discuss matters and could jolly and tease each other unmercifully, without losing our tempers, and very often, either one of us would deliberately assume an attitude and maintain a stand, that we did not feel, merely in order to bring about a discussion and to draw the other out. Although in the beginning I actually had no faith in his theory of the Manabis having used the green material for lenses, even though I could not account for the minute work they accomplished on any hypothesis other than the use of lenses of some sort, yet, as time went on and Ramon's indisputably correct calculations and formulæ were developed, I became more or less convinced that, in the main points of his theories at least, he was correct.

I had, in fact, quietly, and I confess secretly, done a little in the line of experimenting myself. With infinite labor I had fitted bits of the green material together, and I had convinced myself that they had never formed any portion of any utensil, vessel or image. In fact, from what I could determine, they were portions of most irregular and remarkably shaped objects, and, had it not been for the obvious evidences of having been artificially formed, I should have deemed them bits of some natural mineral mass or cluster of crystals.

Indeed, I was rapidly becoming almost as deeply interested in the solution of the mystery of the green substance as was Professor Amador, and I constantly found myself speculating on its purposes and its origin

and neglecting my archeological interests. But of one thing I felt positive. Whatever the origin of the material, my friend had less than one chance in a million of finding it by wandering blindly over the adjacent territory. I well knew how extremely difficult—almost impossible—it is to find anything in a tropical jungle. I had myself searched for weeks for Maya ruins in Central America, for the remains of vast, massive temples and immense stone monuments, and had often passed and repassed within a few yards of them without suspecting their presence. And I had heard the same story from numerous mining engineers and prospectors, who had fruitlessly searched for months for the outcrops of mineral veins which—from float samples—they knew existed within a very restricted area.

Of course there was the remote possibility of Ramon stumbling upon the deposit by sheer luck, and, had there been any inhabitants in the district—either Indians or mestizos—enquiries among them might have given him a clue. But the district was uninhabited; none of my peons were familiar with the territory, and much as I wished my friend every success, yet I felt that his quest was merely a waste of time and energy.

According to my notebooks and field-diary, it was three weeks after Ramon had commenced his search that he returned at the end of the day, so highly elated, so evidently filled with excitement, that I knew his efforts must have been crowned with success.

"Congratulate me, *amigo!*" he cried. "*I have found it at last! It is marvelous, astounding! No, I shall not tell you; I shall not describe it. You must see it for yourself; you must come with me tomorrow. And it is near—not three miles from where we sit! I stumbled upon it by accident. And I was right. The material is artificial. But it is not the handiwork of any human being!*"

"How on earth can that be?" I demanded. "How can any substance be artificial yet not the result of man's handiwork? For heaven's sake, man, make yourself clear or I shall begin to doubt everything and shall think you have gone crazy on the subject."

But he merely laughed, maintained his air of secrecy, and refused to explain anything. Naturally my curiosity was aroused, the more so when, to prove he had found the deposit, he produced a good-sized lump of the green material, a peculiar, somewhat irregular mass perhaps four inches in diameter and with one side roughly convex.

"But this *has* been worked!" I exclaimed, as I examined it. "By Jove! I believe you are right and that this is a lens in the making."

Ramon grinned. "Yes, in the rough," he admitted, "but not worked by human hands."

"Piffle!" I cried. "You mean to stand here and try to convince me this mass of mineral hasn't been cut or chipped into form! Why try to make mysteries out of nothing? It's remarkable enough to discover that the Manabis had lenses, without trying to add to the wonder of it."

"Nevertheless it is the truth," he insisted. "But I won't say another word until you see what I have discovered. Then, my friend, the laugh will be on you."

NEEDLESS to say I was as anxious to visit my friend's find as was he, and on the following morning, as soon as we had finished our coffee, we started off. For a space we pushed through the jungle, a most unpleasant place in the early morning before the sun had dried the moisture from the leaves. Then we went along the bank of a small stream, across a ridge, until we came to one of those tongues of barren rocky desert, which, along this coast, extend down from the mountains almost to the sea. Here was a bowl-like depression in the ridge, a crater-like pit perhaps fifty feet in diameter and twenty feet in depth, and surrounded by a rim of fine sand which caused it to stand out prominently from the dark pyroxene rocks and reddish-brown tufa.

"Behold!" cried Ramon, dramatically indicating the depression with a gesture.

I stared into the pit. In the center of the bottom was a roughly-rounded blackish mass, and, gleaming in the sunlight amid the sand of the pit's circumference, were numberless masses of the peculiar green material I have described.

I scrambled into the hollow and examined them. There was no doubt about it. They were the same, and, varied in size from a few inches across to masses a yard or more in diameter.

My companion was grinning delightedly. "*Now do you understand?*" he cried. "*Was I not right when I said it was artificial, but not the work of man?*"

"Not as far as I can see," I replied. "Quite obviously the mineral is not the result of human handiwork, but equally obviously it is *not* artificial."

"For a scientist, you are not a keen observer," commented Ramon, who had joined me in the pit. "*I do not claim to be a geologist and yet the whole affair was plain to me almost as soon as I discovered this spot. Have you examined that black mass beside you? You will find it a meteorite. This pit is the crater it formed in striking the earth, and this green substance is a compound formed by the terrific heat and pressure of the meteor's impact, which fused certain elements and produced the material that has been a mystery.*"

I realized that Ramon was right. There was no doubt about the immense mass of material being a meteorite, and a closer examination of the green stuff revealed indications of its having been fused. But there was one thing that puzzled me. When I picked up one of the lumps of substance I found one surface roughly convex, exactly as was the piece Ramon had brought in to camp the night previous.

"Ah!" I ejaculated. "I see the Manabis *have* been at work here. It is strange they should have attempted to manufacture their lenses in such a place."

Professor Amador smiled, "Mistaken again," he chuckled. "No human hands have touched that before yours. The Manabis had nature on their side. If you examine the meteorite carefully you will find that its surface is made up of slightly concave facets or depressions. And if you place the piece of material in your hand upon the surface of the aerolite you will discover that it fits perfectly into some one of those depressions. Undoubtedly, when the meteorite fell and

fused the minerals where it struck, the molten matter formed a coating or shell about it. In time, owing perhaps to weathering, perhaps to the shrinkage as the material cooled, the fused matter broke off and fell from the meteor, each piece being molded convex on one side where it had been cast into form, as I might say. No doubt the Manabis, finding these rather attractive bits of semi-transparent material, polished the surfaces and by accident discovered that they possessed lenses."

While he was speaking I had been most painstakingly examining both the meteor and the mineral I had picked up.

"I admit your explanation sounds plausible," I replied. "But, as you just admitted, you are *not* a geologist. Neither am I for that matter, although I *did* take a special course in that science when at Yale. And I am afraid I must quote your own words of a short time ago and inform you, my very dear friend, that *you* are not a keen observer. You have, to make use of a time-honored saying, put the cart before the horse in a way. You are no doubt correct in regard to the meteorite generating heat and pressure when it struck; possibly it may have fused certain portions of the rock and sand here. But your green mineral substance is *not* the result of that. On the contrary, it is the crystalline form of the meteorite itself. The mass, of course, was incandescent as it passed through our atmosphere. Probably, in fact unquestionably, when it fell, this area was under water, and the sudden cooling, perhaps combined with chemical reactions if it was salt water, as it probably was, caused the outer surface of the meteor to crystallize.

"If you question the accuracy of my deductions, you have only to examine both the meteor and the green substance. You will find that, under a lens, minute crystals of the same character are everywhere distributed in the mass of the meteorite."

"Hm, I admit you may be right," muttered Ramon, after he had followed my suggestion, "but," he added triumphantly, "that does not in any way affect my statement. Whether the material was formed from molten sand or rock, or whether it was produced from the aerolite itself, is merely a technical question. The main point is that it was produced by a meteorite falling upon our planet, and was not fabricated by man, and that the crude lenses were formed by nature in the way I have explained. But," he continued thoughtfully, "your discovery explains why I could not analyze the material. Meteorites, I understand, contain some remarkable and perhaps unknown elements. No wonder I could not identify them! And—*amigo mio*," he cried excitedly, "we may be on the verge of an astounding discovery! For all we know the material brought to us from the heavens, from another planet, may possess characters—optical or otherwise—which are wholly undreamed of, totally unknown! *Caramba!* I am impatient to experiment, to solve the secrets, the mysteries of this celestial substance. And I stand here idly talking, wasting precious moments!"

I laughed. "Considering that this meteor and the green material has been here for several thousand, probably several hundred-thousand years, a few min-

utes' delay is of no great consequence," I reminded him. "But, all joking aside, I do not blame you for your impatience. I am almost as deeply interested in it as you are. I shall await the outcome of your experiments with the greatest interest, Ramon. And I most heartily congratulate you upon your great good fortune in discovering this most astonishing source of the material, brought, as you say, from another world, another planet."

CHAPTER IV

IT was indeed fortunate that Professor Amador had had the foresight to bring a completely equipped laboratory and workshop with him. Had he been forced to return to the United States in order to conduct his experiments I truly believe he would have gone mad with impatience, and he might never have made the most astonishing discovery of all. Moreover, had he carried out his experimental work in the States, very serious and regrettable results might have followed. And yet, on the other hand, had he not brought such a complete outfit along, he might still be with us, and the final results that I am about to narrate might not—in fact could not—have transpired.

Having taken a number of the best pieces of the new material (which Ramon named Manabinite) to his laboratory, he busied himself day and night experimenting with small specimens of the mineral, covering sheets of paper with abstract and involved mathematical calculations, conducting exhaustive physical and chemical tests and cutting, grinding and polishing the strange material.

"It's almost as hard as sapphire," he informed me, "but, it has a most remarkable property of cleaving on the plane of its rounded surface when it is struck in certain spots, or of cleaving at right angles to its axis if struck on another spot. I have not fully worked out its optical properties yet, but I should say off-hand that its refractive index is fully equal if not in excess of that of the diamond. A lens composed of it should, theoretically, magnify an object fully fifty times more than a glass lens of the same formula. Think of it, my friend! Think what that means to science, to optics, to humanity! Think what wonders of biology and nature may be revealed when we have microscope objectives capable of enlarging an object fifty times more than any lens yet produced! Think what it will mean in astronomy! Why, *amigo mio*, with a telescope lens of this material, no larger than any of the great objectives already in use, we should be able to view the trees, the houses upon Mars!"

"Provided," I reminded him, "that your theories are borne out, that the Manabinite is sufficiently transparent to be used as powerful lenses, and provided that you can obtain masses large enough for manufacturing such lenses. You forget, Ramon, that, as far as we have reason to believe, the entire world's supply of Manabinite is in that miniature meteor crater. I cannot say how much is there, but I should hazard a guess that the quantity is exceedingly limited, and that the largest piece is far too small to be transformed into a telescope objective for studying the planets."

Ramon's face fell. "Yes, that is so," he grudgingly admitted. "I have searched the pit thoroughly—have dug deep into the surrounding sand and rocks, have even gone several feet below the meteor itself, and have gathered every fragment and flake I can find. The total amount is woefully small. In fact I might say it is inadequate for carrying on as many experiments as I would wish. Yes, unless we can discover another deposit—which is practically impossible under the conditions—or unless I can discover how to imitate Manabinite artificially, then I fear very much that my discovery—our discovery—will be of little real value to the world. But," he cried, once more enthusiastic, "it is going to solve the problem of Manabi art and, who knows, perhaps the mystery of Tiahuanaco and other cyclopean works as well."

"Just what have you accomplished so far?" I asked him. "Have you started making a lens yet? It seems to me that the first and most important step would be to make a small lens and test it out. You may find the darned thing won't work at all."

"It will work, all right," he assured me. "Yes, I have been busy a goodly portion of the time, grinding a lens from a small mass of Manabinite. I have worked along rather revolutionary lines and am grinding the lens to conform to the formula worked out by a determination of its refractive qualities. By to-morrow I hope to have it completed. Then, *amigo mio*, for the great test."

Of course we were both keyed up when, on the following day, Ramon announced that the lens was completed, and that he would like to have me present when he made his first test. It was very thoughtful of him to do this, and I fully appreciated how great a sacrifice it had been for him to refrain from satisfying his desire and curiosity until I could be with him.

I must admit that he had done a most beautiful piece of work. The lens was as beautiful as a polished emerald, and seemed actually to glow with internal fires.

"There is one thing certain," I laughed, as I admired it. "Even if this Manabinite is worthless for lenses you can make a fortune selling it for gems. It is harder than emeralds, you say, and to my mind much more beautiful. And, best of all, there is such a limited quantity that the market will never be flooded."

Ramon smiled. "No doubt," he agreed. "But let us defer any such matters until after we have had a look through this lens. Here, my friend, if it had not been for you, I never should have come here nor made this discovery. It is your right and privilege to be the first to look through a lens of Manabinite."

IN vain I protested. Ramon insisted and, grasping the glorious green lens, I held it between my eyes and the little pile of golden grains that Ramon had placed upon the table. For a moment I could see only a marvelous, vastly deep, apparently fathomless, green light. It seemed like looking into the very depth of a tropical sea. And then suddenly, unexpectedly, an object seemed to rush towards me, to burst through the wondrous green, to hurl it aside, and I involuntarily uttered a sharp, surprised exclamation. But the next instant my

cry changed to one of utter amazement and incredulity. The object had come to rest, a great dull-yellow mass like a submerged mountain, a mass, the surface of which was scored, cut, incised with deep rough furrows, ravines, valley and cañons. But I recognized them instantly. They were orderly arranged, they followed definite lines, and I knew that I was gazing upon the immensely enlarged surface of one of the minute gold beads upon the table-top.

"It is marvelous, amazing, absolutely incredible!" I cried, handing the lens reluctantly to Ramon. "No wonder the Manabis could manufacture such beads, could engrave a lapis-lazuli idol with microscopic designs. Why, man, that bead looks as big as a mountain! It must be magnified hundreds—thousands of diameters!"

But I doubt very much if Ramon even heard my voice. He, too, had seen, and entirely forgetting his surroundings, he was exclaiming, enthusing, almost shouting in his native Spanish.

At last he tore his eyes from the seemingly magic lens, and, with a deep sigh, dropped limply into a chair.

"It is true. It is as I thought, as I hoped!" he cried. "Success has come at last! Ah, *amigo mio*, if you only knew the fears, the doubts that I have had. If you only realized the blow it would have been had all my calculations, my theories and my labors come to nothing! I would have been crushed, discouraged and—do you know, my dear good friend—your ridicule would have been the hardest of all to bear! But now!" he jumped up, filled with energy and life. "Now, I have proved everything. What a lens! Do you not agree, *amigo*?"

"Ramon," I said, seizing his hand and looking into his eyes. "I never dreamed that you took my bantering seriously. Come, old man, forgive me, won't you? But I realized what work and life you have put into this thing. You have overdone. You must take a rest. You have triumphed, mightily, beyond my words to express. You have revolutionized optics, my friend. What more do you want?"

Ramon's lips parted in that happy, boyish smile I loved. "Now you are taking me too seriously!" he cried. "You forget I am a temperamental Latin with the Indian tendency to enjoy a bit of martyrdom and self-pity. No, I never actually took your railleury seriously. I believed all along that, in the bottom of your heart, you thought much as I did. But I cannot rest yet. I have only commenced. This is merely a beginning. Why, *amigo*, that tiny lens is simply a crude experiment. It is not perfectly ground, its curvature is largely guesswork, and it is made from an imperfect piece of Manabinite. Wait until I make a really good lens and see what you will see."

But when, after a number of days' incessant labor, my friend had made a second lens—or rather had remade the first—to exactly conform with his ideas, his formulae and his theories, I could not see that it was very much superior to the first. I admitted that it was slightly clearer, that it magnified the objects beneath to a greater extent, but it was no more remarkable than

the first lens which, to me, was still a veritable marvel.

And Ramon was bitterly disappointed. He had accomplished wonders, his deductions and theories had been borne out, but somewhere he had made some error and he completely lost sight of the fact that he had apparently solved the mystery of the Manabis' secret in his failure to accomplish what he had hoped for. The discovery of some new optical or physical law.

"There is nothing new or revolutionary about it," he declared, when we were discussing the matter one day. "To be sure, Manabinite possesses most remarkable qualities of magnification, but that is due to its refractive index, not to any new law. Very probably an immense diamond might prove to possess most unusual powers as a lens, although there is something else, some elusive hidden peculiarity of the composition, the crystallization or the color of Manabinite that adds to its power. But that does not mean anything really new.

"And there is another thing that perhaps you have not noticed. This lens, or rather these lenses, I have made, possess very little depth of focus—almost none at all, in fact. Outside of a very small portion of the object brought under them, in a necessarily restricted area all within the same plane, nothing is magnified, nothing is clear. In fact the rest of the object is practically invisible. That is why you were so surprised when the gold bead seemed to leap at you when you first looked through the lens. Until the bead was within the very shallow focal plane of the lens, you saw nothing, then, as you brought a portion of its surface into focus, it sprang into view. With an ordinary lens, even where there is little depth of focus, there is a blurred, but visible image of the entire object under the glass, even of surrounding objects, for the glass is transparent. But with the Manabinite lens, everything, but the small portion actually sharply focussed, is shut off as if by a screen. That puzzles me, and I cannot solve the mystery. Just as soon as an object is within focus, the lens seems to become perfectly transparent—even the green tint vanishes—but as far as everything else is concerned, the lens might as well be opaque. And for that reason, *amigo*, I am sure I have not yet solved the problem of how the Manabis made their minute beads and carved their invisible designs."

"What?" I cried. "You mean you do not believe they used Manabinite lenses? You mean you have cast aside all your assumptions and theories? Good heavens, Ramon, you are queer! Just when you have convinced me you were right, you turn about and claim you were wrong. Why, man, you must be taking leave of your senses! Here you have absolutely proved your theories, have proved that the Manabis had lenses capable of magnifying objects hundreds of times, and then you tell me you haven't solved the problem!"

RAMON shook his head. "For a man who always boasts that nothing is proved until it is demonstrated, you take a most remarkable attitude," he replied. "You say I have proved the Manabis used lenses of Manabinite when performing their remarkable feats of sculpture and handicraft. But I have done nothing

of the sort. I have proved that Manabinite possesses unique powers of magnification. I proved nothing more. And I have proved to my own satisfaction that, when it was used in the form of an ordinary lens, Manabinite would have been almost, if not quite useless, to the aborigines who occupied this site. Suppose, just to demonstrate your assumption, that you try to do a little work upon some object while it is viewed by your eyes through the lens. I have tried it and I have found it utterly impossible. It is hopeless, an impossibility, to keep the tool used and the surface upon which it is used in focus at the same time. And it is equally hopeless to try to follow out a design or a pattern upon any object when only a very limited portion of that object is visible. If you doubt me, try to make a drawing of some very simple form—one of your prehistoric pots or a human being or a pig—anything, in fact, by cutting a round hole in a sheet of paper, placing this over another sheet and drawing the object bit by bit upon the surface of the paper visible through the hole. I'll wager that when you have finished, the result of your labors will be utterly unrecognizable. No, my friend, if the Manabis fashioned their miniature objects by means of a lens, it was a lens through which they could see the entire surface of the object upon which they worked. But," he added vehemently, "there *must* be an answer, there is a solution. I am positive they used Manabinite. I am equally positive they *did not* use it in the form of an ordinary lens, and, *gracias da Dios*, I am going to discover what they *did* use. And when I do, *amigo mio*, I will discover the great secret, the unknown law of optics or physics or both. I shall do it even if I spend the rest of my life at it!"

I was almost dumbfounded. What Ramon had told me—and now I realized it was all true—came as something of a shock. I was convinced that the Manabis could never have worked under a lens with the properties of the lenses which Ramon had made, and all the smug satisfaction I had felt because my friend had solved the riddle had been ruthlessly destroyed by his words. The lenses had been so astonishing in their magnifying powers, that I had overlooked their shortcomings. Now I was fully aware of them.

"Possibly," I ventured after a time, "the Manabis may have treated the lenses in some way. Isn't it possible that Manabinite might be changed by heating or tempering or something? I have always understood that glass may be greatly altered by annealing."

Ramon shook his head. "I have tried," he declared, "but without any result. Moreover, I have compared the fragments of lenses found here with the crude materials. As far as I can determine, the two are identical in every way. No, I must look farther for the answer. And, do you know, I have a feeling, a hunch, as you would call it, that the answer is not so far off. Do you remember those fragments we found which so greatly puzzled me? Those pieces with angular surfaces where there should have been curves? I have been racking my brains, trying to figure out what they were, what they meant, and I believe that therein lies the key to the whole matter."

"I remember them well," I told him. "But to me

they appeared more like natural crystalline forms than hand-made. But whatever you do must be done very soon, my friend. The rainy season is not far off, and when the rains set in, this locality is no place for civilized human beings."

"If I have not completed my work by then, I shall continue my experiments in the United States," he declared, as he disappeared in his laboratory.

Three days later, Ramon dashed from his workshop, wild-eyed, dishevelled, gasping for breath. Never before had I seen him in such a state. He seemed frightened, terrified, and for a brief moment I thought he had gone raving mad. But his first words were reassuring. "I have found it!" he fairly yelled. "It's marvelous, astounding, miraculous! And by accident, by chance, I came upon it! It was last night," he continued, striving to control himself and speak intelligibly. "Last night I dropped the lens just before retiring. It broke—splintered; you remember I told you the Manabinite had a peculiar cleavage. Disgusted, discouraged, I gathered up the splinters—they would be bad things to tread upon with bare feet, and throwing the smaller fragments aside, I laid the largest piece upon my table and went to bed. I arose this morning, remembered the accident of last night, and glanced ruefully towards the spot where I had placed the remains of all my labors. *Santa Maria!* how I stared, speechless, startled, even terrified. The Manabinite had vanished, and in its place I saw a monster, a huge, a gigantic insect; an enormous bug! His great cold eyes seemed fixed upon me balefully, his hairy legs seemed poised, tensed, ready to spring. I could scarcely believe my eyes. Never had mortal eyes gazed upon such a creature. Cautiously, grasping a stout stick, my curiosity overcoming my first fright, I stepped towards the table the better to examine the giant insect. Then the incredible happened!

"The huge insect vanished before my eyes, disappeared completely, instantly, and in his place, just where I had left it, was the piece of Manabinite! I rubbed my eyes, speechless, unbelieving, fearing I had gone mad! Then as I gazed, I noticed a minute dark speck beside the shattered lens. I bent close to examine it. Then I understood. Then like a flash all was clear. The wonder of wonders. The tiny speck was an insect, a minute thrips, the liliputian counterpart of the giant bug I had seen. I stepped back, gazing fixedly at the lump of green mineral. One, two, three steps. As though dissolved in air, the Manabinite vanished and there, once more, was the ugly, horrible, giant insect! It was impossible, incredible, but true. Chance, accident, fate, perhaps the good God Himself, had produced the results I had labored in vain to achieve. The shattered bit of Manabinite had taken on the form that enabled it to project a stupendously magnified image of an object near it. And, most marvelous, most wonderful of all, in doing so, it became itself invisible! Come with me, *amigo*, come to my laboratory and see for yourself. Observe the miracle, the wonder of it! I have not dared to touch it."

AMAZED, hardly able to grasp the meaning of his words, I hurried with Ramon to his laboratory.

All he had related had not prepared me for the amazing, unbelievable thing I saw. As I entered, my eyes turned to his writing table. Resting upon it was a roughly angular piece of Manabinite. Then, as my friend led me to one side, my eyes still fixed upon the green material, I gasped, stared, for as far as I could see the table top was bare; the Manabinite had vanished as if by magic. Ramon's voice brought me to my senses.

"*Que lastima?*" ("What a misfortune!") he cried, "The thrips has gone, you cannot see the ogre that greeted me. But wait. Keep your eyes focussed as they are."

Hurrying forward, he reached toward the table, and, as though conjured from the air, a huge, gleaming golden ball lay upon the table before my amazed eyes!

Instantly I recognized it. It was one of the almost microscopic gold beads, but appearing the size of a football, its chased design, every detail of its surface, clearly defined. But of the fragment of Manabinite that produced this miracle, there was no visible trace. Still keeping my eyes upon the glorious golden ball, I stepped forward, extended my hand, and touched the hard, glass-like surface of the Manabinite! Still without removing my gaze, I moved slowly to one side. Like a flash the gold ball had vanished, and beneath my fingers was the green, semi-transparent piece of mineral! I gasped, and sank into Ramon's chair. It was too much, too startling, too utterly incredible for my brain to assimilate.

Ramon was wild with excitement, mad with delight. He fairly danced; he chattered in Spanish, he babbled in English.

"Do you not understand, *amigo mio?*" he cried. "Do you not grasp the reason for this miracle? Do you not realize what a discovery this is?"

I shook my head. "I realize it is so," I replied. "But why, how, by what uncanny means this miracle, as you call it, is brought about, is beyond me."

"There are many things, many phenomena which I myself do not as yet understand," he confessed. "But already—*pronto*, in a flash—I have grasped much, have understood much. It is the action of a prism, not of a lens. By the merest chance, by its natural cleavage, this bit of Manabinite assumed a prismatic form. By another chance—or guided by Fate or God—I placed this prism upon my table in such a position that a tiny thrips—an humble, despised plant-louse, came into its refractive field. Otherwise, my dear friend, I never would have known; I should have thrown the broken lens aside, and never would we have solved the mystery or witnessed this miracle. But how the miracle is accomplished, why the crystal itself vanishes when it magnifies an object, what becomes of its color, what the optical principles and laws that govern it may be—these are all unsolved mysteries, matters to be worked out. And they are all new, wonderful, revolutionary. But now the matter is simple. I shall make more prisms, shall improve them, shall polish the surfaces, and shall devote myself to determining all the secrets of the astounding material and its properties. But we now know how the Manabis performed their wonderful feats of carving and of handiwork. And the puzzle

of those bits of Manabinite with angular surfaces, is solved. They, too, were fragments of prisms. But—"his face fell and an expression so lugubrious swept across his features that I laughed. "But," he lamented, "my discovery—our discovery, will be of no value to the world, although it should be of the greatest. There is no more Manabinite besides the negligible quantity in our possession."

CHAPTER V

BUT if Professor Amador was pessimistic in regard to the benefit his discovery might prove to the world, his interest in the remarkable material and its even more remarkable properties was not abated. In fact it was vastly increased, and for days, and nights, he worked feverishly in his laboratory, appearing only for his meals, which he gulped down hurriedly.

"Now that I have the key to the optical peculiarities of Manabinite," he declared, a few days after his amazing demonstration, "I have definite lines upon which to work. You thought that fragment of the mineral gave astounding results, but that was merely a crude, an accidentally formed prism. I shall make a real one, a cut, ground and polished prism, mathematically constructed from the data obtainable from that fragment. Then, *amigo mio*, we shall see what we shall see."

And when, after the most intensive work, Ramon produced his beautifully finished Manabinite prism, it proved as much superior to the prismatic fragment as a high-powered microscope objective is superior to a twenty-five cent reading-glass.

Viewed through it, the tiny golden beads appeared as two-foot spheres of gleaming intricately-engraved metal. Innumerable beautifully-chased designs, which had been hitherto invisible, could be traced between the grooves of the coarser carving, and, as I studied these, I became convinced that they formed inscriptions in some unknown form of glyphs. The sculptured designs upon the lapis-lazuli idol proved to be of the same character, but words cannot express the marvelous beauty and incredibly fine work upon this. What the amount of the magnifying power of the prism was, I cannot say precisely, but I should judge it to have been roughly about five hundred diameters. But unlike a powerful lens of the conventional type, the prism possessed a tremendous depth of focus and a very wide field. Objects were sharp and clear when placed anywhere from a few inches to several yards from the prism, and their magnified images were as perfect when the observer was yards from the prism as when he was within a few inches of it.

Indeed, there was no effect of gazing into a lens. The magnified image appeared like the real thing, actually and physically enlarged, an illusion that was due largely, no doubt, to the amazing property of the Manabinite losing its visible color and seeming to vanish completely when viewed from a certain angle. I mentioned these matters to Ramon, who smiled knowingly.

"Not being familiar with the laws of physics and optics," he replied, "you cannot differentiate between the two. From a technical and scientific viewpoint Manabinite possesses no peculiarities worth mentioning;

its optical qualities, in fact, are no better than ordinary crystal—"

"Nonsense," I interrupted. "Could you make any crystal prism or lens to approach, not to mention equal, this of Manabinite?"

Ramon shook his head. "I could not; neither could anyone else. But that is not because of the optical peculiarities of the mineral. If you will allow me to explain, possibly I may make my meaning clear, my friend. As I said, Manabinite has no unusual optical qualities. But it *does* possess the most remarkable, amazing and hitherto unknown physical peculiarities. I have convinced myself that the apparent magnification that you witness is not what you and I at first thought it. Magnification, in the ordinary sense of the term and as brought about by lenses, is due to the refraction of light rays, so bent, or rather so altered, in their angles of incidence, by passing through the lens, that they project an image of larger size. Moreover, a lens, if the curvatures are reversed, will reduce the image of an object. But my most exhaustive tests with Manabinite prove that reversing the prism, or even the lens from the material, will not project a reduced image.

"In fact, you may test this for yourself. Viewed from the opposite direction, the prism appears as an almost opaque mass of green mineral and nothing is visible through it. No, *amigo mio*, the magnified image projected by Manabinite is not produced by the alteration of light rays, or more properly speaking, light waves, but by means of some other form of vibratory waves. For some unknown and undeterminable reason, Manabinite, when formed into a certain combination of angles or facets, absorbs the vibratory waves or the movements of electrons present in the matter within the sphere of its influence, and throws them off at an entirely different vibratory speed, or a distinct electronic motion. It—"

"That all sounds very learned, but also very complicated and somewhat contradictory and abstruse," I remarked. "Do you—"

"Pardon me for interrupting your question," he continued. "I shall try to make my meaning clear by some comparisons. You are, perhaps, slightly familiar with the practice or the theory of 'stepping-up' electrical voltage."

I assented.

"And you, as a radio enthusiast, must understand the principles of so-called amplification."

"Yes," I agreed.

"Very well," he proceeded. "I might compare the Manabinite prism—if it may be called such, to a transformer or an amplifier. Just as the amplifying units of a radio receiving set pick up the inaudible vibratory waves—which as you know are merely ether movements—and emit them as vastly increased sound waves in air, so the Manabinite prism I have made picks up visible light waves and throws them off tremendously increased."

I shook my head hopelessly. "Perhaps I am unusually dense," I confessed, "but I cannot understand how a light wave—which is very distinct from an electromagnetic wave, can be increased by physical means."

PROFESSOR AMADOR snorted and muttered some Spanish expletive. "It is fortunate that I am a very patient man," he declared, his merry smile proving that he was by no means as out of patience with my stupidity as his words implied. "As you know perfectly well, or as any man of your intelligence, education and scientific training *should* know, the so-called electro-magnetic waves, the light, even the heat waves are all closely related, if not identical, the only differences between them lying in the speed of their vibrations or their so-called 'wave-lengths.' If you heat a piece of metal, you produce heat waves emanating from it which will burn your fingers, but which you cannot detect by sight. If you heat it more, until it becomes red-hot, you transform the invisible heat rays to light rays which *are* visible. And it is merely a matter of heating it still further until you produce, or rather transform the red rays, to light rays at the opposite end of the spectrum—the violet rays. Our poor eyesight does not permit us to 'tune in' on any light rays below red or above violet, yet we know that there is a long range of light-waves at both ends of the spectrum, among them the infra-red, the ultra-violet, the Roentgen, etc. We really know very little about these, and we know still less about various other waves, the vibratory waves that produce scent, for example, the waves that guide various birds, mammals, reptiles and even insects from place to place, the sound waves beyond the range of the human ear, etc. But we *do* know that all of the waves first mentioned are merely the result of the ether moving or shifting about. By crowding more than the normal quota of electrons into any object, or by forcing some of the normal quota out, we produce various waves—heat, light, radio, X-rays and what not. And my experiments and my exhaustive calculations have proved, to my own satisfaction at least, that Manabinite, when in the form I have made, has the power of altering the normal movements of electrons in objects placed in a certain relation to it and of reforming these electrons to produce a greatly enlarged replica of the object. Also, I know that in so doing, the Manabinite itself is reduced to electronic movements and actually becomes a portion, an integral part of the increased object."

"But," I objected, "you infer that the object itself is enlarged, and that what we look upon as an image, a product of light and shade, is a *bona fide* object, the same object increased in size! Why, man alive, in that case, we could touch and handle the magnified edition of the object. Utter nonsense, Ramon, that is absolutely impossible!"

He laughed. "Nothing is impossible," he declared. "A few years ago many matters that are everyday affairs to us would have been deemed impossible."

"We can and do transmit pictures—visible moving reproductions of people and other things—for hundreds and thousands of miles through space—by means of television apparatus. You may see a miniature man or woman on the screen of your television receiver. But that does not mean that the actual person has been transported bodily and reduced in size. The original at the transmitting end is still intact, living and unaffected.

And neither can you touch, handle or feel the image before you. Is the result brought about by Manabinite any more remarkable, any more impossible?"

I had to admit that it was not. And yet, somehow, I could not grasp it. I could not quite conceive of a bit of semi-transparent mineral capable of accomplishing such seeming miracles. I had to have another look, and I took an even greater interest in the prism than before. But I could see Ramon's point, when he demonstrated it to me. By very simple diagrams and equations he proved that it would contradict and upset all recognized and established optical laws for a lens to magnify to such an extent and yet have such a depth of focus and such a wide field. I learned that the relationship between magnification, focal-plane, depth of focus, field, and the size and form of a lens, were all fixed, unalterable and could be most accurately worked out. And, when I raised the objection that the established laws had been fixed on the basis of materials with certain refractive powers—thus thinking I was showing a great deal of cleverness and knowledge—my friend quickly proved that the refractive index of Manabinite had been calculated and proven by himself, and that, working from it, it would still be impossible to account for the remarkable features of the case on a basis of optics. Moreover, by sketching a plan of the prism-like mass he had made, and then bringing optical laws to bear upon it, he convinced me that it would be utterly impossible for such a form to serve the purpose of a lens.

"But," I again objected. "I remember, when studying biology, that I had to make many drawings through a microscope, using a camera-lucida for the purpose. The arrangement I used consisted of a small prism, and virtually reflected the image of the object on the slide upon a sheet of paper upon the table, so that I could see my pencil and the image at the same time, and merely had to draw the lines and fill in the details as though tracing a picture already there. Isn't it possible that this Manabinite prism acts as an exaggerated camera-lucida?"

Ramon smiled indulgently, half pityingly. "You forget," he replied, "that the camera-lucida of your microscope did not magnify the object you were studying. The objective or lens did that, and the camera merely shifted the image in the eyepiece to a paper below it. Now here is another most remarkable quality or property of this Manabinite prism. The ordinary lens, even the camera-lucida you mentioned, is a projector. If you place a sheet of paper back of a lens—at the same distance from it where your eye would secure a focal image, a refracted or projected image will appear upon the paper. But, in this case, no such projected image appears. See here!"

As he spoke, he held a sheet of writing paper back of the Manabinite, moving it backwards and forwards, but it remained white, with no trace of the image I could so plainly see with my eyes.

I ACTUALLY gasped. But more astonishing revelations were to come. "Now please stand back of the paper," said Ramon. "You are convinced that no image is projected upon the sheet; but what do you see now?"

"Good Heavens!" I ejaculated. "The paper has vanished! I can see the image; I can see your hand. But what's become of the paper?"

"That," chuckled Professor Amador, "is more than I can tell you. All I know is that certain tissues—mostly inorganic, but a few of organic origin, seem to vanish when placed within the range of the projected waves or lines of electronic movement produced by the prism. My hand or yours, our bodies, leather, almost any animal matter in fact, remains unchanged no matter where it is placed. But paper, wood, any metal or mineral I have tried, cloth, and numerous other substances, become as transparent—or as invisible—as glass or even air. The phenomenon, of course, has a direct connection with the interruption and alteration of waves of electronic force, but just why some materials should be affected and others not, is something of a problem. However, it is not without precedent. Radium for example, or rather its radioactive emanations, pass through nearly all substances, but do not pass through lead. Metals, water, etc., are so-called conductors of electricity, but rubber, wood and other substances insulate it. Water will pass through cloth, paper, even through wood, but not through metals, rubber and other materials. Even—"

"Here, here!" I exclaimed. "That's an entirely different matter. The cloth, paper, etc., are porous—loosely put together, as I might say, and the water passes through the minute openings between the fibers."

"Exactly," chuckled Ramon. "Exactly for the same reason that electricity passes through some substances and not through others; exactly as light passes through some materials and is excluded by others; exactly as heat passes through some objects and not through others. And why? Merely because the materials which allow electrical, light, heat, or other waves to pass through them are, as you put it 'porous' or loosely put together, in so far as their electronical arrangement is concerned, whereas others that bar the same waves are too dense in their electronical compositions to permit the waves passing between the electrons or atoms. Perhaps I may make myself more easily understood if I take the liberty of comparing, say a sheet of hard rubber, to a wall built up of loose but closely fitted stones, while a similar wall, composed of large irregular stones with large spaces between them, may represent the sheet of copper. Now, if we compare an electrical current, or more properly an electrical discharge, to a charge of shot, and fire this at the wall of closely-fitted stones, none of the shot will pass through the barrier. But, if it is fired at the other wall, the shot will pass through between the stones. In each case, I might add, the stones and the shot are analogous with electrons. Now, *amigo mio*, my theory—mind you, it is a theory and nothing else—is that the emanations of electrons absorbed and thrown out in magnified form by this Manabinite prism, are so altered that the properties of ordinary electrons, as we understand them, are completely upset. In other words, the ratio of the electrons to other substances when issuing from the prism is not the same as the ratio of the electrons to similar substances under normal conditions. And—you

will no doubt scoff at this—I firmly believe that, with a little more experimenting, I can devise a Manabinite prism which will so magnify the electronical waves, that an atom will be made visible!"

"Now, I am sure your overwork has affected your brain," I declared. "For Heaven's sake, Ramon, drop all this. Be satisfied with what you have accomplished and don't let the thing get you. How can any invisible thing be made visible? You're talking nonsense, man."

"A week or two ago," said Ramon slowly and thoughtfully, "I should have considered any man mad who dared state that the results we see before us would be possible. And when you speak of things as 'invisible' you are talking from a circumscribed and narrow viewpoint, and in comparative terms only. Unquestionably many things invisible to human beings are plainly visible to other creatures—the infra-red and ultra-violet rays for example. Our eyes are very crude, very inadequate and generally degenerated organs, and yet we have the effrontery to declare that anything that our poor, purblind eyes cannot discern is invisible!"

"Why, *amigo mio*," he continued, "what is visible to one man may be totally invisible to another. We do not even know if you and I see the same thing when we look at the same object. You state an object is green, I agree with you; but no one can be sure that green as I call it looks the same to me as does the green you see. Nothing in human senses varies much more than eyesight and yet, so egotistical, so self-important, so cocksure of himself is man, that he cannot believe in what he does not see, and declares, like yourself, that anything—an atom for instance, is invisible. And I would like you to explain, if you can, why or how an atom—even an electron—can be invisible in the true sense of the word? Every substance, as you must admit in the light of latter-day science, is composed of electrons and protons. If protons and electrons are truly, scientifically, invisible, how can any number of invisible atoms form a visible mass? No, no, my archeological friend, we cannot see atoms or electrons merely for the very excellent reason that, individually, they are too minute for our eyes to detect. But magnify them ten thousand, fifty thousand, one hundred thousand diameters and who can say they will not be visible. And I see no reason why, with a little labor and experimenting, perhaps by a series of step-ups, so to say, perhaps by altering the angles, a Manabinite prism may not be made which will render atoms visible. To accomplish that marvel shall be my object in life henceforth. If the rainy season arrives, I shall continue my experiments in the United States. But we have at least a month more here. Before the expiration of that time, I hope to be able to prove to you that I am as sane as ever, and I hope to let you view the atomic structure of some well-known object."

"Ramon," I said, slapping him on the back, "You are a wonder. You are, without doubt, the greatest physicist in the world. You have made a most astounding discovery. But I am afraid that you have undertaken more than you bargained for this time. However, I wish you the best of luck. And," I added with a

laugh, "when you succeed, let me have a peep at a real live atom."

CHAPTER VI

MANY a true word is spoken in jest, as I soon learned, and little did I dream how soon I should be permitted to look upon a living atom. But I am getting ahead of my story.

The time was rapidly approaching when we would be forced to leave. I had already ceased my excavatory work and was busy with my peons packing my accumulated specimens and preparing for our departure, when Ramon, his wide eyes and his excited mien speaking of some great event, rushed to me, seized me by the arm, and fairly dragged me to his laboratory.

"At last!" he cried, "*Gracias a Dios, amigo mio*, I am successful! At last, at the eleventh hour, at the very moment when I had abandoned hope, I accomplished the miracle! It terrifies me; it is too wonderful, too amazing! But you shall see for yourself!"

Unable to believe him, thinking he was grossly exaggerating his progress, I entered his workshop.

Resting upon a specially devised stand upon his table was a large mass of Manabinite, a much larger piece than I had thought existed. I learned later that this was formed by fitting together a number of smaller pieces. Its form was that of the prism (I call it prism for want of a better term, though it was a many-angled, complex form in reality) and, even in the brief glance I took, I noticed that it seemed to be surrounded with a peculiar nimbus or haze which, while it could not be called visible, was still discernible, (a rather paradoxical statement) and which was similar in its appearance to the undulating masses of heated air that one sees rising above hot roads or sands. It was, in fact, exactly as if the Manabinite was almost red hot. But I scarcely had time to note this and I had no time to give it any thought or attention, for Ramon had dragged me to a spot back of the apparatus.

"Look!" he cried excitedly. "Look, my friend, and gaze at what no other living man but myself has ever seen!"

At first I could see nothing, nothing but that same waving, undulating vapor, and then slowly, as though a thin veil or a film of smoke was being drawn aside, I saw a startling sight. Before my wondering unbelieving eyes was a deep unfathomable blue, composed of thousands, millions, trillions perhaps, of pale-blue globular objects; translucent, with radiating internal lines; objects that reminded me of globular jelly-fishes, and each and every one whirling, rotating upon its axis and about each of its fellows. Never have I seen or dreamed of such motion, such a mad turmoil, such an inextricable, confused rush of bodies. And yet, as I gazed transfixed, wondering what marvel I was seeing, I noticed that there was no confusion, no variation in the movements of the things; they never collided, never touched, never varied a millionth of an inch from their courses. Ramon was fairly dancing with delight at my evident amazement.

"Now do you say 'impossible'?" he shouted. "Now do you say the atom is invisible?"

"Do you mean those creatures are atoms?" I demanded, without shifting my eyes from the fascinating scene before me. "To me they appear more like the highly magnified inhabitants of a drop of swamp water."

"Scoffer, unbeliever!" he cackled. "You are looking upon atoms—upon the atoms composing a bit of blue cloth. I chose cloth because the atomic arrangement is fairly open. In a denser material—in stone or metal—I feared the atoms might not be visible. But I know now it makes no difference how they are arranged. And watch!" he cried, "behold the wonder of atomic behavior!"

As he spoke, he picked up a large reading glass and focussed the sun upon the table in front of the Manabinite. Instantly the strange moving blue globules redoubled their speed. Like a flock of birds striving to escape from a swooping hawk, they rushed madly hither and thither. Rapidly, before my staring eyes, they began to vanish, until their numbers had been reduced to at least half, and there were wide voids between those that remained.

"That is the result of heat," cried Ramon. "I heated the cloth slightly and its fibers 'expanded' as we so crudely put it. And now for the opposite extreme. Watch the result of cooling!"

As if by magic, the globules—or atoms, as I must call them, for I could no longer doubt my friend's assertions—materialized from nowhere, came rushing into view, until, in a few seconds, they were so closely packed, that I expected momentarily to witness a collision; I held my breath, for somewhere, in some forgotten corner of my brain, I remembered that scientists averred, the collision of two atoms might disrupt the world. Now the atoms were moving more slowly, slipping past one another, rotating around one another so closely packed that no visible spaces lay between them.

Was it possible, I thought, that my own flesh, my own body, the table beside me, my clothing—everything—was really made up of these tiny, globular jelly-fish like objects? It seemed incredible, impossible, despite my companion's rapid-fire explanations, exclamations and dissertations. My mind was detached, I scarcely heard, and certainly did not comprehend, what he was saying, and my every sense was centered on the amazing sight before me and I was striving to convince myself, to believe that I actually was looking at atoms.

But there are some things which the ordinary human mind cannot grasp all at once, and my mind—which I flatter myself is slightly above the average—could not assimilate this marvel. Despite Ramon's assurances, despite the evidence of my own senses, I could not help feeling that it was unreal, that I was looking at some fantastic, imaginary picture.

FOR hours we two watched with breathless interest as Professor Amador experimented with various substances before his astonishing apparatus. We observed the atomic structures of stones, wood, metal, paper; but, for some inexplicable reason, which

Ramon confessed was utterly beyond his comprehension, the prisms failed to reveal the atoms in any substance of animal origin. Ramon's hand, when placed before the prism, showed merely as an enormously magnified hand. Leather remained leather, though the minute pits left by the hairs appeared like the craters of extinct volcanoes, and where there were woolen threads in a bit of cloth, there were great vacant opaque spaces between the gyrating atoms of the cotton threads. In fact, just as the first prism had failed to project the images of anything of an animal nature, although it would project the image of almost anything else, so this remarkable apparatus failed to develop its astonishing properties when animal matter was placed before it.

"It has something to do with the vibratory waves of animal tissue," declared Ramon, when at last, we wearied of our experiments. "But," he added, "I will solve that puzzle also. And I am going much farther, my friend. There are no limits, no bounds to the possibilities of my discovery. I said I would render atoms visible. I have done so. Before I finish, I shall render electrons visible, too."

In vain I argued with him. He had, figuratively speaking, gone mad on the subject and, like most scientific men, nothing would satisfy him until he had pursued his experiments to the very limit. By that I do not mean to scoff at or belittle scientists. I am, or consider myself, a scientist also, but archeology is a comparatively exact science, and experiments do not enter into it, whereas in Ramon's case—and in the case of various other branches of science—experimental work is the predominant factor. Had Ramon been content to rest on his laurels, to be satisfied with the discoveries he had made—which Heaven knows were marvelous and astounding enough—the events which followed never would have occurred, and Professor Amador would still have been with us.

Although I knew that it was high time for us to be leaving, yet I could not desert my companion and, as the rains appeared to be holding off, I decided to be patient, to humor Ramon for a time in the hopes that he would soon weary of his fruitless attempts, or would come to his senses, and I occupied my time very profitably by writing up my notes, drafting a summary of my observations and conclusions, and preparing my monograph on the Manabi cultural development.

Meanwhile Ramon worked under his usual high pressure, but, from what I could gather from the rather meager information he volunteered, he made no progress towards his goal. He did, however, make another discovery which he considered of great importance, namely,

END OF PART I.

that by slightly altering the planes or angles of his prism, he could greatly vary the magnifying power of the Manabinite. The same piece of mineral, or rather the combined pieces, could, in this way, be made to reveal atoms or could be used to magnify an object only a few diameters, at will. Every grade of magnification between the two extremes was possible, and Ramon had contrived a very delicate and ingenious device for altering the magnifying powers of his prism. In other words, the prism was, when equipped with this apparatus, capable of being focussed. At least that was what it amounted to, although he gave it some other technical term, which has slipped my mind. But, try as he would, he could not devise a method of increasing the magnifying powers beyond a certain point, the point, in fact, at which the atoms became visible.

"But it can be done," he insisted. "If the power of Manabinite can be increased from almost nil to hundreds of thousands of diameters, there is no scientific reason why that power should not be capable of being increased still farther—to an unlimited extent even."

I snorted. "There may be no scientific reason," I remarked, "but neither is there any scientific reason why the Manabinite should not reveal atoms in animal matter as well as in other materials. Yet it does not."

"The trouble with you is," I continued, "that you are trying to apply the ordinary laws of nature and of science to a substance which—from my own observations and from yours—is most obviously extraordinary and is quite outside the pale of ordinary science or physics. Now, for Heaven's sake, drop your fruitless experiments, Ramon. Pack up your outfit and your amazing prism, gather up every bit of Manabinite there is, and come out of this. Then, if you wish, go on with your experiments in the States,—or in your own Peru if you wish, and spend the rest of your life at it, if it will make you any happier."

"I suppose you're right," he admitted regretfully. "But somehow, *amigo mio*, I have a strange, unaccountable and inexplicable feeling that if I leave here I shall never succeed. I suppose it's pure nonsense, but over and over again, I have been on the point of packing up; and each time was seized with a real fear, a dread, almost a terror—a premonition perhaps—that if I left this spot, a terrible disappointment—a catastrophe in fact, would result. You see," he smiled in that charming way he had, "the Indian blood in my veins is superstitious, or perhaps psychic, and at times it gains ascendancy over my common sense. However, I have made up my mind. I shall begin packing at once."

The Hollister Experiment *By Walter Kateley*

WHAT causes dwarfs and giants? Science today tells us that either is caused by glandular disorders, and what makes a whale or an elephant enormous, and why doesn't the cat or rooster take on the proportions of elephants or whales? That is something science is not prepared, as yet, to exactly explain.

Dwarfism or gigantism can be artificially produced

however, and the time may not be far off, when it will be possible to artificially breed animals or human beings to almost any size desired within reason.

In the present story, the author, who has a deep insight into this branch of science, is presenting our readers with a capital story, that will make you gasp for its sheer daring.

This story is published in the Winter Edition of AMAZING STORIES QUARTERLY

The FACE of ISIS

By Cyril G. Wates

Author of: "The Visitation."

CHAPTER I

The Golden Casket



ELLIOTT COURTLAND swung into the driver's seat, his face aglow with pleasure. He stepped on the starter, threw in the gear and released the clutch.

There was a crash as the little roadster backed violently into a portly and dignified limousine, which was reposing pompously at the curb a few feet behind us.

"Damn!" ejaculated Courtland, "That's as bad as Old Waddles and the Face of Isis!"

MANY years before, Courtland and I were classmates, but after our graduation we drifted apart and I had not heard from him for a long time. At last, business called me east. The morning after my arrival in Boston, I left my hotel and turned down Boylston Street. As I was standing at the corner of Washington, waiting for the traffic signals to change, I received a violent blow between the shoulder blades and wheeled around to behold my old schoolmate.

"By the Pyramids of Egypt!" he roared, "If it isn't Pete the Polliwog!"

"You seem to be in some doubt about it," I grumbled, wishing that elbows were double jointed, so that I could rub my spine, "How do you know I'm not the Emir of Afghanistan in disguise?"

"Good old Pete!" cried Courtland, pumphandling my arm like mad, "I'd know that homely frog face if I saw it in the Aquarium. Where are you bound? It doesn't matter, anyhow; you're going with me. Come on, Leicester's in the next block."

Unheeding my protests, he hurried me along to where a rather dilapidated sporting car was parked.

"Jump in! Jump in!" he cried.

"But where is your friend?" I asked, doubtfully, Mr.—er—Mr. Leicester?"

Courtland roared with glee.

"Leicester! This is Leicester. Got tired of Lizzie. No name for a bachelor's car. So called him Leicester. You know, Queen Lizzie's best beau. Earl of Leicester."

Courtland all over. Rattle-brained as ever. And then, in his excitement, he threw the gear shift into reverse instead of low and brought about the collision which called forth his cryptic remark.

"That's as bad as Old Waddles and the Face of Isis!"

I thought it wise not to interrupt him in his duties

at the steering wheel, to demand an explanation. Waddles I knew. It was the popular name for Dr. Myron Wadsworth, Professor of Inorganic Chemistry under whom Courtland and I had learned our first smattering of the mysteries of spectrum analysis. I remembered the little man vividly, with his faultlessly trimmed Vanddyke beard and gold pince-nez, hurrying across the Campus with that peculiar waddle, which, in combination with his name, had been responsible for the cognomen "Old Waddles." He always carried a cane, not to assist his faltering steps, for it never touched the ground, and besides, he was extremely active, but to keep his hat on! He invariably grasped that cane like a billiard cue and rested the crook on the crown of his grey felt hat. It made no difference to Waddles whether the wind blew a hurricane or a zephyr, that cane was used for one purpose only—to hold his hat on!

Yes, I knew Old Waddles, but Courtland's reference to the "Face of Isis" left me completely in the dark. It sounded like the name of some heathen idol. Persian or Egyptian. Egyptian, that was it. But what an Egyptian God had to do with Waddles, and what they both had to do with a broken down car, was beyond my power of imagination.

Presently we escaped from the thick of the traffic and were clattering up Commonwealth Avenue bound for the Cambridge side of the Charles. No longer in imminent danger of sudden death, I ventured to ask for an explanation, sensing a possible story for my newspaper, out West.

"Oh! that!" exclaimed Courtland, "The Face of Isis! Quite an adventure! Poor old Waddles, he was mad as a wet hen! I'll take you out to the shanty and my Jap'll get us a snack. After dinner, I'll tell you the story, if you care to hear it."

OUR well-known author comes forward with a different sort of story that will cause quite a good deal of thought and provoke quite as much comment. We know it will at once become a target for our Discussion Department and every anti-gravitation enthusiast will pounce upon the new ideas advanced in the present story.

THAT evening, in Courtland's cosy den, with our pipes lit and drawing well and our feet stretched out on the fender, I reminded my friend of his promise. Courtland

puffed thoughtfully for a few seconds.

"Know anything about Egyptology?" he asked, abruptly.

"Not a thing. Why?"

He rose and went to a large cabinet and returned bearing a metal casket about a foot square and perhaps half as deep. He handed it to me and I exclaimed in surprise as I felt its weight.

"What do you think of that?" asked Courtland. "It's solid gold, you know. Fifth Dynasty. King Kutamen-Pash. That's his cartouche on the corners."



When it started from the bottom, it traveled very slowly until it reached the mouth, level with the floor of the temple. Then it flew off, not vertically, but horizontally, just skimming the floor.

The casket, which must have been immensely valuable, was a marvel of the goldsmith's art. At the corners were four female figures, each bearing in uplifted hands, a scarab inscribed with the king's name and titles in the customary hieroglyphics. On the head of each of these statues was a curious crown like a globe with two curved horns.

The top of the casket bore a design in bas-relief, representing a bull with its forehoofs resting on a crescent and the brow of the animal bore another scarab inscribed with the royal symbols. The sides of the box were closely covered with rows and rows of hieroglyphics. I turned the massive casket over and on the bottom, which was otherwise perfectly smooth, was a deeply incised pattern.

"This looks for all the world like a working drawing for some kind of machine," I commented.

"You're not far wrong, at that," replied Courtland, as he took the casket from me and set it on the table. And then he told me the promised story. I cannot attempt to reproduce Courtland's jerky, emphatic speech, or the graphic gestures, with which he filled in the gaps in his narrative. The whole story was so improbable that I should have doubted Courtland's veracity, but for the dumb witness of the glittering golden casket on the table. Professor Wadsworth is dead, so his evidence is not available. Courtland has given me permission to publish the story, so here it is. Take it or leave it!

CHAPTER II

The Mountains of Morocco

DURING his last two years at school, Courtland was one of Professor Wadsworth's favorite pupils, not on account of any special aptitude in chemistry, but because the professor discovered Courtland in the school library one day, absorbed in a book on ancient Inca civilization. It happened that archaeology was Old Waddles' special hobby and he had devoted much time to the theory that the Aztec culture was an offshoot of that of the ancient Egyptians.

In Courtland, he found a devoted disciple and the friendship which developed as the result of a common interest, continued after Courtland left school and entered Harvard. It came as no surprise to Courtland, therefore, when, shortly after his graduation, he received a letter from the professor, inviting him to act as his assistant in an expedition to the west coast of Morocco, where Waddles hoped to find evidences of an Egyptian migration to Mexico.

Courtland, who was under no material necessity to work for his living, snatched at the opportunity for adventure, and after hurried but thorough preparations, the last week in October found him embarked with the Professor on the *S. S. Glaconic*, bound for Southampton. Here they trans-shipped to Havre and thence journeyed by train through France and over the border to Cadiz on the southern coast of Spain.

At Cadiz they succeeded in chartering a small sailing vessel with a villainous looking captain and a still more disreputable crew.

And five days later they and their belongings were put

ashore at Ifni, a Spanish port on the coast of Morocco.

Courtland explained to me at considerable length Old Waddles' reasons for believing that if relics of an ancient Egyptian migration existed at all, they would be found in the vicinity of the southern branch of the Atlas Mountains, which come down almost to the shore line at Ifni, but as this explanation has absolutely no bearing upon the remarkable events which arose from the expedition, I will omit it here and refer the curious reader to Prof. Wadsworth's monumental work, "History of the Egyptian Migration in the Fifth and Sixth Dynasties."

Although the travelers were now within a few miles of their destination, their difficulties had only begun. They sought out Captain André Guilemont, the French Consul, with whom the professor had been in correspondence, and by him they were introduced to Signor Ostora, the Spanish governor of Ifni. They finally succeeded in persuading the governor that they were neither treasure hunters nor American brigands, and after much shrugging of shoulders and many Spanish expletives, he agreed to assist them in organizing a transport train to take them into the interior.

And so, ten days after their arrival in Morocco, a motley procession wound its way through the outskirts of Ifni and plodded across the sandy waste beyond. First came Achmed Idrees, the guide, astride a raw-boned nag and looking very patriarchal in his kaftan and tarboosh. Next in order were Courtland and Professor Wadsworth, on ponies, the professor presenting quite an oriental appearance in a red fez, which he held on by means of the crook of his inseparable walking stick; then came a train of donkeys and camels, laden with tents, bedding, boxes of food, water-skins, spades, picks, and all the mingled paraphernalia of an exploring party. As they wound their way amongst sand dunes and over dried water courses, they could see the snow-capped summits of the so-called Anti-Atlas range, glistening in the blazing sunlight, far to the northeast.

The professor had told Achmed that they wished to go to the mountains, but that he would decide upon their exact destination after they left Ifni. They had been traveling for two hours, when the guide reined in his steed.

"You tell Achmed where you want go, Sidi, Achmed take. Take nenyplace. You tell where."

The Professor, who had been scanning the jagged outline of the mountains through his binoculars, pointed to a deep notch, on either side of which rose mighty peaks.

"Do you see that notch, Achmed?"

"What mean 'Nosh,' Sidi?"

"The opening in the mountains."

"Yes. Me see. Me know. Dat called Djibel el Sheetan. Same you call Debil Hill. You want me take?"

"Yes, that's the place. How long will it take us to get there, Achmed?"

"One, two, t'ree day, Sidi. Country lot rough. Rocks, mountain, no much water."

Achmed spurred his horse.

"Yallah, halluf!" he yelled.

"If I am not wrong in my surmise," remarked the professor, "that notch is the only pass through which the Egyptian explorers could have reached the coast when traveling by the route which I am confident they followed."

"But wouldn't there be a better chance of finding traces of their passage on the coast itself?" suggested Courtland, "Shipyards, stone causeways, workmen's dwellings and that sort of thing."

"You are undoubtedly correct that such engineering works existed in great abundance, Courtland, but it would be useless to search for any traces of them now. The western shore line of Africa has been sinking for many centuries and the Egyptian shipyards are sunk fathoms deep in the ocean. If any buildings remain above the water, the Moors have torn them down long ago and used the material for other purposes."

"But why should we have any better luck in the mountains, Professor? It seems to me that the Egyptians would have merely camped en route. Just tents and shacks. No permanent remains."

"That's because you are thinking in terms of modern exploration, Courtland. You must remember that the ancients traveled very slowly and in large parties, establishing themselves step by step, more or less permanently. The journey from Egypt to the coast of Morocco was a matter of years, perhaps of generations. Besides, the crossing of the mountains must have been a very laborious undertaking, so it seems logical that they would erect their permanent dwellings and storehouses at the foot of the pass, rather than at the coast. However, we shall see when we get there."

That night the party camped at a well, surrounded by scraggy palms. The following day they began to enter the foothills and the mighty peaks, which flanked the pass, rose higher and higher on each hand as they advanced. Courtland's attention was especially attracted by an extraordinary pinnacle of rock which dominated the entrance to the pass. It towered up to a height of perhaps eight hundred feet above the surrounding terrain, and its sides were so smooth and vertical, that it gave the impression of a monolith erected by the hand of man.

"Dat Djibel el Sheetan." Achmed replied to Courtland's question. "Igram teller say Debil lib on top of he. Achmed no believe dat."

THEY made camp on the third day on a broad expanse of level ground west of the great rock tower. Beyond rose the precipitous walls of the gorge leading to the pass and in the misty distance shone the sea, like a silver shield.

The scenery was grand and wild beyond description, but the professor displayed no interest in the beauties of nature when Courtland called his attention to them. His mind was entirely taken up with certain rounded humps which broke the even level of the plain at intervals. As soon as the tents were pitched and a meal eaten, the archaeologist started off on a tour of investigation. He was confident that treasures were to be found in the mysterious mounds; treasures which would put the far famed "Valley of the Kings" utterly in the

shade. Already he saw the name of Professor Myron Wadsworth in glaring headlines on the front page of all the principal newspapers.

The following day the men were put to work excavating one of the mounds which the professor had selected. Courtland superintended the digging, while the professor waddled from place to place, very much excited and very much in the way. Nor was his enthusiasm abated in the slightest as days passed into weeks without anything more valuable being found than rocks and sand.

The workmen moved from one mound to another, sinking a vertical well in the top of each to the level of the base, but without results. Courtland was fast losing hope and even the professor was becoming discouraged. Then, one day, came a discovery of such unquestioned genuineness, that their spirits were raised to the heights again.

There was one very large mound which actually touched the beetling cliffs of the Djibel el Sheetan. The exploration of this had been left until the last. The Moorish workmen were turning over the rocks at the top of the mound in preparation for digging, when Courtland's eye caught the glint of something metallic in the loose gravel underneath. In a moment he was on his hands and knees burrowing and he extracted a peculiarly shaped object which he handed to the professor, who was jumping up and down with excitement and thumping the crown of his fez with his cane.

The article which Courtland had found was apparently of solid gold, encrusted with the dirt of centuries. It consisted of a flat bar bent into the shape of an elongated horseshoe. A handle was affixed to the narrow end and there were five thin rods running crossways through holes in the sides of the horseshoe.

On each of the bars were a number of rings which tinkled like little bells when the thing was taken by the handle and shaken.

"A SISTRUM! AN UNDOUBTED SISTRUM!" shouted the professor.

"A cistern?" queried Courtland, puzzled.

"A sistrum!" reiterated the savant. "If we don't find anything else, our case is proved." And he hopped up and down in his excitement, while the Moors stood in a circle staring and muttering Arabic exclamations, evidently convinced that El Tebib Sidi, as they called Wadsworth, had taken leave of his senses.

"But what is it?" asked Courtland.

"Musical instrument! Fifth Dynasty!" panted the professor. "Used in celebrating rites of the Goddess Isis!"

How long the professor might have continued his gyrations of delight will never be known, for his attention and that of the others was attracted by a purring sound coming from the direction of the pass. A moment later an airplane shot out from between the sides of the gorge and swooping gracefully downward, landed on the level surface near the camp.

The Moors had become too well accustomed to having their soldiers attacked by French aviators to display any emotion save that of curiosity at the sight of the plane, but the two Americans were at a loss to imagine

what any pilot could be doing, flying across the Atlas Mountains. Could it be that the French authorities at Tangier had got wind of their expedition and had sent a plane to put a stop to any further excavations? That would have been a bitter pill to swallow after their recent find!

Courtland and the Professor hurried down the slope, the latter still clasping his precious sistrum to his breast. Half way to camp, they met the pilot, a tall, slender fellow with a little sandy moustache and a most woe-begone expression on his countenance.

"Little bit of luck, what? Finding you chaps here. Forced landing, you know. Engine trouble, just as I got through the mountains."

"Darned lucky you didn't have to land up in the gorge," remarked Courtland. "Come far?"

"Cairo. Trying to make a non-stop flight to Tangier. That confounded valve settled my hash."

"You are a long way south of your direct route, sir," said the Professor.

"Yes, worse luck!" the pilot replied. "Big sand-storm over the Sahara. Had to turn south or I shouldn't have made it at all. You fellows starting a mine of sorts, what?"

Courtland introduced himself and Professor Wadsworth and explained that they were archaeologists. Their visitor returned the compliment by giving his name as Roderick Ainsley, pilot for a big English aviation company. The explorers extended him a cordial invitation to lunch.

"By Jove! I shall be jolly glad to put on the old feedbag!" exclaimed Ainsley. "Expected to make the trip in five hours or less and didn't carry any fodder."

LATER, after a hearty meal and a good cigar, Ainsley began to display interest in the activities of the two Americans.

"So you're archaeologists. Must be jolly interesting, hunting for dinosaur bones and fossils and what not!"

The Professor explained the difference between geology and archaeology, and proudly displayed the golden sistrum.

Ainsley fingered it and looked thoughtful.

"So this doo-dad was used by priests, eh? Of course it would be lying close to the temple, wouldn't it?"

"That is what we hope," said the Professor, "and with this remarkable discovery to encourage us, we shall continue our excavations until we find it."

Ainsley puffed at his cigar and looked still more thoughtful.

"If I were you fellows, I wouldn't bother doing any more digging," he drawled. "You don't need to if you don't want to, you know."

"What do you mean? Why don't we need to?" cried the two explorers in a breath.

"Because I've seen the temple, you know. Regular Egyptian, like the one at Philæ," replied the Englishman simply, quite unaware of the bomb he was exploding.

"Where? Where?" cried the Professor.

"Just over there," replied Ainsley, pointing to the west.

"But that's the way we came!" sputtered the Pro-

fessor. "There's nothing over that way except the Djibél el Sheetan and the foothills."

"So that's what they call it. Devil Mountain. Appropriate name, what? Bally temple's on top of it."

"On top of the rock! How can there be a temple on top of the rock? We can see the whole of the pinnacle from here and there's no sign of a temple!"

"Saw it as I came over the pass," said Ainsley. "Top's hollow and the temple stands in the middle. Thought you chaps would know all about it."

The Professor's excitement was unbounded and Courtland was equally astonished. No wonder they had found the sistrum close to the foot of the pinnacle. Some priest had evidently dropped it from the parapet and had been unable to find it. The golden trinket had lain where it fell for over two thousand years. The mound at the foot of the tower probably represented the debris from the building on the summit.

Professor Wadsworth was all for rushing off to verify Ainsley's astonishing discovery, but Courtland reminded him that their first duty as hosts was to assist the aviator to repair the damage to his machine. Fortunately the trouble proved to be a small matter and before sunset repairs were effected. The Professor suggested that Mr. Ainsley might take them up to the temple in his airplane, but the pilot pointed out the sheer impossibility of landing a plane on a space only about fifty feet in diameter, and the archaeologist reluctantly abandoned the idea.

Courtland and the Professor got little sleep that night. The latter tossed and turned on his camp cot, his mind a whirl of joyful anticipation of what the morrow might bring forth. Courtland's thoughts were equally wakeful but more practical. How could they ever reach the aerial temple? By what means could they hope to scale those awful cliffs?

But Ainsley's mind was free from either worry or anticipation. His beloved plane was repaired and he slept the sleep of the tired aviator, while the others listened enviously to the even flow of his breathing.

At the first peep of dawn they were up and eating breakfast. Ainsley shook hands and wished them luck with their explorations. He clambered into the pilot's seat and presently the roar of his engine echoed from the cliffs as he taxied across the level ground and rose into the clear air.

The plane swept in a wide circle around the mysterious summit of the Djibél el Sheetan and Ainsley waved his hand encouragingly as he set his course to the north.

CHAPTER III The Hidden Temple

AS soon as the purr of the engine passed out of hearing, Courtland and Wadsworth started for a thorough examination of the rock pinnacle with a view to its ascent. They circled it repeatedly, looking for the slightest crack or ledge by which they might hope to worm their way up the sheer precipice, but were obliged to confess that they could see no means by which they would be able to climb even part of the distance to their goal. Courtland, who had considerable

experience in the art of mountaineering, decided that the rock-tower was unclimbable.

At last Courtland suggested that they should abandon their search for the present and walk part way up the slopes of one of the peaks adjoining the pass, in order, if possible, to get a glimpse of the hidden temple through their glasses. They had walked about a mile from the base of the tower, when the Professor, happening to look back, was struck by a peculiar marking on the rock and called Courtland's attention to it.

"Yes. I see what you mean," said Courtland. "Dark line. Absolutely vertical. Runs from base to summit. Vein in the rock, probably."

"I'm quite sure we should have noticed any such vein if it existed," replied Wadsworth. "Let us go back. Who knows? It may be a crack we have overlooked. You see, it terminates at the bottom just to the left of the mound."

They hurried back, but as they approached the pinnacle, the dark line gradually faded until it vanished completely. A careful inspection at the place where the line had been seen, failed to reveal any explanation of this peculiar phenomenon. At last Courtland suggested walking back to the spot where the mark was visible and examining it through a telescope.

At once the mystery was cleared away! The line consisted of a series of notches or steps at intervals of about twelve inches. The upper side of these notches was sloped off gradually to allow room for the leg and knee of a person ascending them. This explained their invisibility from below, for the steps blended into the rock when viewed from this position. A more careful inspection revealed the fact that the lowest step came within about twenty feet of the ground level. It was evident that a ladder had been used to start the ascent or that the ground had been lowered in the course of centuries by the process of erosion.

The Professor was exultant. They had only to build a short ladder, set it against the rock, walk up the steps and the summit with its ancient secrets was theirs.

And this they actually did. Late that night the ladder was completed. The following morning it was carried over to the Djibel el Sheetan and set against the rock at the point they had marked. Wadsworth insisted that he should be the first to make the ascent, but Courtland finally succeeded in persuading the old man that his youth and slender build gave him the advantage, to say nothing of his previous experience in Alpine climbing. So Courtland it was who tied one end of a light line to his belt and started up the ladder.

Eight hundred feet. Eight hundred steps. It was the task of half an hour at the most. And yet, if Courtland lives to be a thousand, he is never likely to forget the horrors of that fearful climb! It was one thing to make some perilous ascent in Switzerland with a trusty guide ahead to hold the rope secure in case of a slip. It was quite another matter to crawl up the face of this obelisk of polished granite, where the slightest misstep meant a sudden and awful death.

As he got higher and higher, a sense of terrible loneliness oppressed him. What if he should tire before

he reached the top? What if cramp should seize him? He could do nothing but simply allow himself to fall; to fall hundreds of feet through the warm, life-giving sunlight to a horrible death on the cruel rocks below.

Up! Up! Up! How heavy the rope was becoming! Would its accumulated weight finally pull him backwards from his holds? How his fingers ached with the effort of clinging to the edges of these cursed, rough-hewn steps!

AN eternity passed. The steady reaching upward of hand and foot had become a mere mechanical repetition, a treadmill over an abyss. And then, he reached his hand for the next hold and felt—nothing!

The shock almost sent him flying into space. Then came the realization like a breath of Paradise, that he was at the summit. A moment and he stood on a wide circular platform looking down into a depression like an artificial crater carved in the top of the pinnacle. And in the center of the cup was the temple, just as Ainsley had described it.

A few feet below him, Courtland discovered a huge boss of rock like the capstan on a ship. To this he attached the end of his line and then, returning to the edge of the parapet, signalled for a heavier rope to be coupled on. When this had been hauled up in turn, the Professor tied the lower end around his waist and commenced the terrible ascent, while Courtland drew in the slack of the rope, belaying it around the knob which was now serving for the first time in perhaps twenty centuries, the purpose for which it was designed.

What the professor lacked in physical strength he more than made up in stoutness of heart, and it was not long before Courtland saw his red fez appear over the edge of the parapet and the two explorers, once more united, stood where no human foot had trod since the days when Cleopatra's navy fled in disorder, leaving her lover to his fate.

The entire summit of the Djibel el Sheetan was hollowed out to a depth of forty or fifty feet, the sides being carved out in a series of steps which ran all the way round, giving the effect of a miniature stadium, with a diameter of a hundred feet. The floor of the bowl was perfectly level and in the center of this circular platform stood the temple, a gem of Egyptian architecture in perfect preservation. The building was square, measuring about ten yards each way. The roof of stone slabs was supported on four rows of exquisitely graceful columns. The floor was slightly raised above the general level and was as smooth as glass.

For a long time the two men stood spellbound. For Courtland this amazing discovery was the climax of a great adventure. The realization that he was looking upon a sight which no human eye had beheld for nearly three milleniums wiped out the memory of the terrible danger he had braved. His imagination pictured the little temple as it had been when swarthy priests in flowing white robes, celebrated their mysterious rites amongst those silent pillars, while rows of bowing worshippers filled the seats around.

Professor Wadsworth's emotions were different in

kind but no less intense. For him it was the culmination of a lifetime of study, the fulfilment of a lifelong ambition. The world, or at least *his* world, the world of science, would acclaim him in no uncertain voice. He would take rank with the greatest archaeologists of all time.

But they were only at the beginning of their discoveries. Greater wonders than any they had yet seen were to come. When they walked down the flight of granite steps, or seats, and approached the central temple, the Professor gave voice to an exclamation of amazement.

"Great Heavens!" he cried, "this is even more marvelous than I had realized. Do you notice anything especially strange in the structure of this building?"

"Well, no, I can't say I do," replied Courtland, "unless you mean the masonry. Those old workmen must have been wonderful stonemasons. Can't see the joints at all."

"Exactly!" agreed the Professor. "But the reason you cannot see the joints is because there are no joints to see. This entire structure, the steps, the pillars, the roof, the polished floor, all have been hewn out of the living rock. What modern achievement of engineering skill can compare with this? To what perfection must those ancient designers have carried their art to carve this gem of architecture from the solid granite, when one error, no matter how slight, would have spoiled the whole?"

By a flight of three steps, they gained the floor of the temple. The first thing that caught their attention was a large circular hole piercing the roof exactly in the center.

"This temple must have been dedicated to the Sun God," remarked the Professor, pointing to the opening. "There was probably an altar in such a position that the sun's rays would strike it exactly at noon."

"There's the altar," said Courtland, pointing to a huge square block of stone on the opposite side of the temple. "And there's the priest, if I'm not mistaken," he added, indicating a pile of bones lying in front of the altar.

In a moment the professor was waddling across the floor to submit this new discovery to examination, when Courtland with a cry of warning, rushed after the little man and seizing him unceremoniously by the collar, jerked him backwards so violently that the Professor sat down on the floor with great suddenness.

"For Heaven's sake, be careful, sir!" Courtland cried, "I thought you were done for!"

"Why! What!" spluttered the Professor, "What's the matter?"

Courtland pointed to the floor directly under the circular opening in the roof.

"You almost stepped into *that*!" he panted.

The even surface of the granite floor was broken by a round hole like the mouth of a well, about six feet in diameter. Its highly polished sides dropped away into impenetrable gloom.

They lay on their faces on the floor and peered down into the gulf which had almost proved the end of Professor Wadsworth's career. The rays of Court-

land's flashlight failed to reveal any bottom to the pit. An empty cartridge case was dropped and the professor's stop-watch showed the interval before a faint tinkle announced that the bottom had been reached.

THE Professor made a rapid calculation in his notebook. "Allowing for the speed of sound and using thirty-two feet per second for the acceleration of gravity, with proper allowance for the resistance of the air," he announced, "the pit is about eight hundred feet deep. That would make the bottom practically level with the ground."

"Why, the pinnacle is like an enormous cannon!" exclaimed Courtland.

"More like a great elevator shaft," amended the Professor. "Ever since we arrived I have been puzzled as to how the ancient priests reached their aerial place of worship. The steps by which we made the ascent are too perilous and laborious for every-day use. They were evidently designed for an emergency."

"Well, if this is an elevator shaft," commented Courtland dryly, "they must have left the car at the first floor. I don't see any push button, so I guess it's the steps for us!"

"It is probable that the car was operated by means of a rope running over a pulley on a wooden framework spanning the hole in the roof," the Professor elucidated. "The woodwork has long since rotted away and followed the car into the shaft."

"But how did they get out when they got to the ground floor?" asked Courtland. "There's no sign of an opening in the rock outside."

"The outlet is probably closed by a skillfully concealed door," said the professor. "Well, there is nothing to be gained by looking down the shaft. Let us examine the altar. There may be an inscription which will throw some light on the purpose of the temple."

They carefully skirted the mouth of the well and approached the place of sacrifice. The altar was a perfectly cubical mass of granite, hewn, like the temple, from the solid rock. It bore no inscription and was unornamented save for a globe and crescent, the latter with its horns turned upwards, rendered in bas-relief.

"The symbol of the goddess Isis," remarked the Professor. "One of the great trinity of deities who dominated the religion of Egypt during the Fifth Dynasty. This building closely resembles the famous temple of Isis at Philæ and it is possible that it was constructed under the supervision of some priest from that temple."

"And perhaps this is the old codger himself," said Courtland, motioning to the heap of bones which lay at their feet.

Although the ligaments which united the bones had long since mouldered away, they could still trace the outlines of the skeleton of a man of large stature. A golden sistrum, the duplicate of the one they had found at the foot of the rock, lay close to the left hand, while the right arm was bent under the body and a dagger with a bronze blade and golden shaft lay among the ghastly ribs.

"Do you see what has happened?" asked Wadsworth in a low voice. "He was the last living soul in this awful place and he offered himself as a sacrifice to the goddess."

"Poor old Buffer!" said Courtland. "Perhaps he was left alone up here, and he couldn't work the elevator and killed himself rather than climb down the outside. Don't know that I blame him!"

While Courtland was philosophizing, the Professor walked around to the rear of the altar. Suddenly he emitted a tremendous shout, which startled Courtland out of his reverie.

"The Stairs! Eureka, the Stairs!" yelled the Professor.

The altar was nothing but a shell! The whole back was hollowed out, for all the world like a miniature subway station, and a flight of steps was visible descending into darkness. A huge slab of granite which had formed the back of the altar, lay on the stone floor. The aged priest, if such he were, had apparently lacked the strength to replace the slab, after making his last ascent.

The Professor was in a frenzy of excitement. He could hardly wait until Courtland had made sure that he had a spare bulb for his flashlight, before rushing down the tunnel. They started, Courtland in the lead. The steps led steeply downward, sweeping round in a great spiral.

Round and round they went, Courtland counting the steps aloud. The flashlight gleamed faintly on the rough-hewn walls and roof of the tunnel. They had long since lost all sense of direction, but they knew that they could not get beyond the confines of the pinnacle.

At last, when Courtland had counted just over a thousand steps, he came to a sudden halt.

"The bottom!" he said.

The Professor plodded down the last few steps and stood beside him. They were in a tiny room, hardly six feet square, and facing them was a door which gave forth a metallic gleam in the rays of the electric light.

The door, which was of solid bronze and bore the globe and crescent of Isis, hung on massive hinges. Courtland put his shoulder against it and swung it open with little effort, revealing a passage through which came a dim light. This must be the entrance from the ground level. But if so, where was the bottom of the shaft? And what was the object of the shaft, since the spiral stairway did away with the Professor's rather fantastic theory of an elevator? Was it possible that the shaft was nothing more than an *oubliette*, a pit of death like those in old French castles, into which unfortunate victims were cast, as a part of the mysterious rites of the goddess?

SOME of these questions were soon to be answered. The explorers passed through the door, walked down a short passage and emerged, not into the open air, but into a large chamber, perfectly circular, at least forty feet in diameter, but barely six feet in height. In the center of the floor was a circular spot of phosphorescence, a ghostly shimmering glow as

though a concealed source of light were shining through a slab of opal glass.

The mysterious light was reflected from the low roof and dimly revealed the limits of this rock-hewn chamber.

"What a weird place!" exclaimed Courtland. "What do you suppose it was used for? And what is that uncanny light?"

"This was probably the burial place for the mummies of the priests," said the Professor. "We may find their tombs carved out of the rock walls. As for the light, it must be due to some radioactive substance in the rock. Let us examine it more closely."

As they approached the uncanny spot of light, Courtland noticed that its surface was not perfectly uniform but was broken at one point by a small, dark object. Suddenly he burst into a shout of laughter and running forward, picked up this object and exhibited it to the Professor.

It was an empty cartridge case!

"One on you, Professor!" he chuckled. "Radioactive substance in the rock! It's the light coming down the elevator shaft and shining on the floor."

So it was nothing very mysterious after all. They stepped into the circle of light, and looking upward, they could see a tiny disk of blue sky, visible through the hole in the temple roof, eight hundred feet above them.

It was Courtland who drew the Professor's attention to the fact that there was no debris of any sort at the bottom of the shaft.

"So that disposes of the idea that it was used as an elevator," he said. "But the question still remains, what was it used for?"

"The most puzzling thing," said the Professor, "is the extreme smoothness of the walls of the shaft. They are polished like the surface of a mirror. If it were merely intended to transmit light or air, the builders, or rather excavators, would hardly have gone to the trouble to polish the sides like that."

"My original notion may be right after all," laughed Courtland. "It may be a cannon and this is the breach we're standing in! Well, let's see if they've left any gunpowder."

Courtland turned the rays of his flashlight on the walls of the circular chamber. At one point a large alcove had been carved out, the roof being raised so that it formed a semi-circular room like a chapel. On the back wall of this alcove was an immense bas-relief representing a bull with its forehoofs resting on a crescent. On the brow of the animal was a scarab inscribed with certain hieroglyphics and on the floor below stood a massive sarcophagus or coffin cut out of a solid block of granite.

The lid of the sarcophagus also bore the design of the bull and crescent. Wadsworth eagerly examined the cartouche or signature on the scarab.

"My dear boy!" he cried. "This discovery is far more important than we have realized. This sarcophagus contains the mummy of no petty priest. It is the burial place of one of the mightiest Pharaohs of the Fifth Dynasty, Kut-Amen-Pash. Here we have

proof, not only of the early settlement of Mexico by the Egyptians, but that the expedition was actually led by Pharaoh himself. Let us attempt to open the coffin."

After tremendous exertion, the two men succeeded in raising the heavy stone lid and sliding it to one side. Courtland flashed his light into the interior. It was empty!

No, not quite empty, for where the head of the mummy should have been, was a golden casket; the casket which Courtland had shown me in his house at Cambridge.

Courtland reached in and laid hold of the casket, but in spite of its small size it took all his strength to lift it. He set it on the floor and the Professor seized the flashlight and began eagerly examining their find.

The lid was secured by a simple bolt. When it was raised, the reason for the great weight of the casket was revealed. It was filled to the brim with a fine powder, apparently of a metallic nature. When Courtland took some of it in the palm of his hand it seemed heavier than any known metal. It was bluish in color with a prismatic sheen, almost like mother-of-pearl.

The hieroglyphics upon the casket were the first, and in fact the only inscription which the explorers found in any part of the hidden temple. Professor Wadsworth was wild to get at the work of translating it, confident that it would open the way to new and more marvelous revelations. He wanted to start the return journey at once, but Courtland pointed out that they had still to decide whether some outlet existed from this chamber to the open air at the foot of the Djibel el Sheetan. So, leaving the golden casket by the empty sarcophagus, they started to examine the walls of the circular room.

Their investigations were at once rewarded. Diametrically opposite the passage by which they had entered was another bronze door, opening into another passage through which came the unmistakable gleam of daylight. They hurried along it. Fifty feet from the door they were brought to a stop at an archway, blocked with masses of broken rock. The daylight they saw, was seeping through the interstices between the rocks and they could hear the excited voices of their Moorish workmen discussing the probable fate of the "Christian Pigs" who had dared the wrath of the Devil by violating the secrets of His Satanic Majesty's special mountain.

Courtland shouted and there was instant silence. After considerable persuasion, he convinced Achmed that the Sidis were unharmed but in need of assistance. At last, guided by Courtland's voice, the Moors pulled the rocks away and the two explorers stepped forth at the top of the mound where they had found the first sistrum. They had been in the bowels of the Djibel el Sheetan for over five hours!

CHAPTER IV

The Secret of the Casket

THE Professor's first care was to translate the hieroglyphics on the golden casket. For two days he shut himself in his tent and refused to be dis-

turbed except at meal times; even then he turned a deaf ear to Courtland's enquiries.

"Wait until I have finished," was all he would say.

Courtland spent the idle hours while the Professor was closeted with the precious casket, in exploring the interior of the great pinnacle. It seemed strange to be able to go and come at his pleasure to the aerial temple which it had almost cost him his life to reach the first time. He found other subterranean chambers, some of which were evidently the living quarters of the priests who had served in the temple above, but nowhere did he find any sign of human occupancy.

Gradually the feeling grew upon him that this ancient structure had been used for only a short period and then vacated. What could have caused the builders suddenly to desert the place of worship which it had cost them such labor to produce, he was unable to guess, but from the temple roof to the bottom of the chamber of the sarcophagus he found no remnant or remains of human life, save the pitiful bleached bones before the great altar of Isis.

Late in the afternoon of the second day of Professor Wadsworth's seclusion, Courtland was sitting on the natural coping which surrounded the summit of the Djibel el Sheetan, absorbed in visions of those far distant days when this silent spot had been the scene of human activity. He looked across the miles of desert to the horizon where the Atlantic shone in the westering sun like a sea of blood, and pictured the Egyptians, the forgotten forerunners of Leif Ericsson and Columbus, setting sail for their great adventure.

His reverie was broken by the sound of hurrying steps. The Professor came scrambling up the tiers of seats, waving aloft some sheets of paper. He sank down beside Courtland and struggled to regain the breath he had expended in his ascent of the long, spiral stairway. He gasped, he puffed, he wheezed, he tried in vain to speak. It was plain that he was under the stress of tremendous excitement. He had some unprecedented discovery to reveal, but his vocal chords refused to obey the dictates of his will. His eyes seemed about to fly from his head.

At last he thrust the sheets of paper into Courtland's hands.

"Read!" he exploded, and then subsided into another fit of wheezing.

So Courtland read the words which had been carved on that golden casket by the hand of the man whose bones lay before the altar.

"Kut-Amen-Pash, the mighty Pharaoh, King of Kings, Lord of the Upper and Lower Lands, wearer of the Double Crown, Prince of Ethiopia, Emperor of Syria and Persia, at whose tread the Evil Ones tremble, at whose smile the Doers of Good are rewarded, by the hand of his servant Osrah, Chief Astrologer and Magician, High Priest of Isis, the divine Mother of Horus.

"The all-powerful Pharaoh, who consorteth with Ra in his courses and setteth his foot upon the face of Isis, having departed from the sight of his servant, to establish a new kingdom, therefore I,

Osrah, am left desolate and being desirous of waiting upon my Lord, purpose to offer myself a great sacrifice to the divine mother, Isis, who has taken the Great One into her all-embracing arms.

"Now in the time past, by virtue of my skill in magic, I found in the mountains of Ethiopia, a certain strange mineral, whereof the remnant is within this casket, and by whose power the Mighty One has been enabled to go hence. When I revealed unto the Pharaoh the marvelous thing which I had discovered, he would fain make trial of its power in his own person. My dissuasions were in vain, neither would he permit me to accompany him, but commanded that I should use my skill in astrology to bring his desires to fruition.

"With a sad heart, therefore, I came to this place, whereof I already knew, and, with many slaves, carved out this temple in honor of the divine Mother, that all things might be done in due order. When all things were ready, the Mighty One came hither and departed hence to his kingdom.

"Now whether the Great One hath reached that kingdom or whither the dog-faced Seth hath utterly destroyed Him, I know not, but being far on in years and weary with waiting for my King to return, I go hence to join him.

"Let him who would follow, read within."

"FUNNY mix up!" commented Courtland, when he had finished perusing this remarkable document. "Don't see that it adds much to what we had already guessed."

"My dear boy," panted the Professor, "that is exactly what I thought when I first translated it, but I have changed my mind. We came here looking for traces of an Egyptian exodus to Mexico and quite by accident we have made the most extraordinary discovery in the history of mankind!"

"Don't quite get you, Professor," said Courtland.

"Evidently not!" chuckled the old man. "Before I explain my meaning, I want you to tell me your interpretation of this paper."

"It seems to me quite simple," said Courtland. "This old codger, the high priest, discovered a mineral, and put a sample in the box. This mineral was useful for something connected with ship building. Kut something-or-other, the Pharaoh, used the mineral for building his fleet and when he sailed for Mexico, he left old thingummy behind. After waiting for a few years for the king to come back, the old priest gets fed up and kills himself in the temple."

"That, in slightly more formal language, was what I thought at first," said the Professor, "and then I began to notice certain curious phrases which did not seem to fit in with this simple explanation. For example, 'who consorteth with Ra in his courses.' Ra was the Sun God. 'Who setteth his foot upon the face of Isis.' Not a very respectful thing to do to the great Goddess Mother of the Universe!"

"It's all Greek to me still," said Courtland.

"Nonsense! Nonsense, my dear boy," cried the Professor impatiently. "It's as clear as crystal. Isis

was the divine mother. In other words, Nature. Her symbol was the moon. Just as the Romans used the name Diana indifferently for the goddess and for the moon which was her symbol, so the Egyptians spoke of the moon as Isis. 'Who setteth foot upon the face of Isis.' Now, do you understand?"

Courtland stared at him stupefied.

"Well—but—Good Heavens! Surely you don't mean—this old Egyptian king——"

"Exactly!" cried the Professor, triumphantly. "He used this metallic powder and went to the moon! No wonder he wouldn't take the high priest along. There wasn't room."

Courtland was dumfounded. Faint suspicions entered his mind that the strain of the last three days had been too much for the Professor's brain. Or perhaps that little red fez was not sufficient protection from the heat of a tropical sun. His face must have revealed his thoughts, for the Professor burst out laughing.

"No, my dear Courtland, I am not crazy. Now listen, and I will tell you my idea of what took place. The high priest accidentally discovered a deposit of some mineral substance which, under certain conditions, had the power of becoming opaque to gravity."

"Like cavorite in Wells' book," interjected Courtland.

"I have not had the pleasure of reading the work you mention," said the Professor. "However, the priest told his master of the discovery and perhaps suggested to him that it might be the solution of aerial flight. The ancient Egyptians were no fools in scientific matters and the Pharaoh became ambitious to experiment with this mysterious substance. He decided to attempt to reach the moon. The ancients had a marvelous knowledge of astronomy but had no conception of the distance separating the heavenly bodies. Pharaoh probably thought the moon was about twenty miles away and that he could go there and back in a few hours."

"Be that as it may, he ordered the high priest to find some secluded spot and prepare for his flight into space. The priest organized an expedition to the west coast of what we now know as Morocco and carved out this temple, probably to propitiate the goddess, whose symbol the Pharaoh was intending to violate. When everything was ready, Pharaoh came here and departed for the moon. I fear it is exceedingly unlikely he ever arrived!"

Courtland was silent. He was at a loss for any reply to the Professor's fantastic theory. The whole thing was so ridiculously impossible. That an Egyptian King who had lived and died nearly thirty centuries ago, could have actually solved the problem of interplanetary flight was too wild an idea to be entertained, and yet he could find no arguments with which to refute the Professor's line of reasoning.

"After all," he said at last, hesitatingly, "we don't know that your interpretation of the inscription is the correct one. Perhaps it has quite a different meaning; a much simpler meaning. The ancients were rather given to flowery language, you know. All this stuff about the 'Face of Isis' and 'Ra in his courses' may be just for rhetorical effect."

"I thought you might say something like that, my boy," said the Professor, "and if I had nothing but this inscription upon which to base my theory, I might agree with you, but I have other evidence which will convince even the most skeptical. First, have you thought of the possible connection between my theory and the great shaft?"

"Why, no. I can't say I have," replied Courtland.

"Poo! Where's your imagination, boy? That shaft is just what you jokingly suggested it might be; a cannon! Only instead of a bullet there was a hollow cage and in place of explosive, they used this anti-gravitational powder. The Pharaoh probably waited until the moon was visible through the shaft and then started. Just as one would point a gun. That's why the shaft is polished so highly. The slightest friction would have been fatal."

"You have an answer to everything," said Courtland, "but—somehow I can't seem to see the thing as you do. It all seems so outlandishly impossible. And another thing: If this metallic powder is antigravitational, why doesn't it fly off into space of its own accord?"

"Do you see the last words of the inscription?" asked the Professor. "Let him who would follow, read within." I have read within."

"Do you mean that there's another inscription inside the casket?" cried Courtland.

"Precisely!" exclaimed the Professor, producing a second sheet of paper. "Read this," he said triumphantly.

Courtland read aloud:

"Let him who would follow the flight of the omnipotent Pharaoh, make for himself a chariot of brass like unto the design upon the bottom of the casket. And the floor thereof shall be of cedar. And it shall be placed in the pit that is beneath the floor of the temple.

"And when the Divine Mother unveileth her face at the full, let him fast and purify his heart and offer sacrifice at the altar. Let him do these things from the going down of Ra to the sixth hour thereafter. Then let him enter into the brazen chariot and strew upon the floor thereof, the powder that is within this casket.

"And when the face of the Divine Mother looketh down upon him through the roof of the temple, let him take the fleshburner and pour it upon the powder which is upon the floor of the chariot. Then shall he be gathered unto the Divine Mother, Isis; even unto the mighty King, Kut-Amen-Pash, who hath gone before."

"Well, are you satisfied, my boy?" said the Professor, when Courtland had finished reading. "Do you wonder that I said we had made the greatest discovery in the history of mankind?"

"For the future I'm ready to believe anything!" Courtland replied. "But what about this design he speaks of?"

"There is a drawing," explained the Professor, "in-

cised in the bottom of the casket. It represents a cylindrical cage of metal strips, with a circular wooden floor. Of course the Egyptian astronomers knew nothing about the cold of space, or the absence of any air, so they simply built a lattice cage. I am afraid that Kut-Amen-Pash was dead within ten seconds of leaving the earth."

"The usual fate of the pioneer!" philosophized Courtland. "But what about this fleshburner he refers to?"

"AT first that puzzled me too," replied the Professor. "Then I realized that since the powder has no gravity screening properties in its normal state, it must be necessary to submit it to the action of some reagent. As the result of the chemical transformation which takes place, a compound is produced which has the property of being opaque to gravity. That is no more surprising than the familiar phenomenon of two transparent liquids which, when mingled, produce an opaque precipitate."

"Then you think the 'fleshburner' is some kind of chemical?"

"I have no doubt of it. Furthermore, there is one class of compounds notable for their power of burning flesh; the acids. It is probable that sulphuric acid, one of the most active substances of which we have any knowledge, is the reagent that was used."

For a few seconds Courtland sat silently considering the Professor's revelation. Suddenly he sprang to his feet and began to execute a wild dance, in dangerous proximity to the edge of the cliff. The Professor watched his antics in amazement.

"My dear boy, do be careful!" he exclaimed. "Whatever is the matter?"

"Why, don't you see?" cried Courtland, slapping the Professor on the back, "if old what's-his-name could go to the moon, so can we! We can build an air-tight chariot, stock it with food, sprinkle the powder on the floor and we're off! Hurrah for Wadsworth and Courtland, Interplanetary Explorers, Limited!"

It was the Professor's turn to be amazed. To him the discovery of the golden casket and the astonishing revelation of the hieroglyphics had meant nothing more than that he, Professor Myron Wadsworth, had taken his place with the greatest archaeologists of all time. That there was any material value in this mysterious powder, anything that could conceivably affect his personal life, had never entered his mind.

And yet, why not? If this thing were indeed so; if this powder really did what the old high priest claimed; if the Pharaoh had really been shot out of the shaft by virtue of some unknown force and had never returned; why should not modern man, with all the resources of modern science at his command, harness this force and actually extend his kingdom to other planets.

To be Professor Wadsworth, the man who discovered the proofs of an Egyptian migration to Mexico, was much. To be Myron Wadsworth, the man who took his life in his hands and reached the moon—why, that was more, infinitely more! Look at Lindbergh! He flew a mere three thousand miles and became, almost overnight, the most talked of man in history. But to fly to

the moon and back; that was equal to more than a hundred times the distance from New York to Paris!

The chemistry class at Blanford College would have been much amazed to see their dignified, if somewhat portly professor, dancing "ring-a-round-a-rosie" with a former pupil on the summit of a pinnacle eight hundred feet high in the Atlas Mountains and shouting at the top of his voice:

"Hurrah for Isis!"

CHAPTER V The Chariot of Isis

TEN days later, the two adventurers were aboard a steamer, en route from Liverpool to New York. Their excitement at the prospect of their insane adventure had increased, rather than diminished, with the flight of time. They discussed it endlessly from every conceivable viewpoint.

In London, Courtland had bought every available book of fiction dealing with imaginary flights to other planets. On board he read them aloud to the slightly contemptuous Professor.

"It won't do any harm to get other people's ideas sir," said Courtland in reply to a particularly violent snort from the Professor, as the result of the account of Cavor's departure into space.

"I am not objecting to the ideas, but to the lack of them," grunted the Professor. "These space flyers all go in the same way—straight up! Whereas, if you cut off the effect of gravity upon a body, that body will not go up, at all!"

"Not go up!" exclaimed Courtland. "Then where will it go?"

"Along of course!" said the Professor.

"Along! I don't understand."

"Let me ask you a question," said the Professor, sitting up in his deck chair. "Suppose you mounted an electromagnet on the edge of a large wheel and caused a piece of soft iron to adhere to one pole of the magnet. When the wheel is rotating, in what direction would the piece of iron move, if you suddenly shut off the magnetizing current?"

Courtland thought for a moment.

"Why, at a tangent to the rim of the wheel, I suppose," he offered, finally.

"Exactly! And when we shut off the force of gravity between our car and the earth, it will move away from the earth tangentially, not straight up."

"Well, but," said Courtland slowly, "the shaft in the Dibel el Sheetan pointed straight up."

"Quite true," said the Professor. "That was because the High Priest knew nothing about the reason for making it any other way. As a matter of fact, the Pharaoh's chariot or coffin, whichever you like to call it, never went through the hole in the temple roof, at all."

"Never went through the hole?" queried Courtland doubtfully.

"Certainly not!" snapped the Professor. "When it started from the bottom, it traveled very slowly until it reached the mouth, level with the floor of the temple.

Then it flew off, not vertically but horizontally, just skimming the floor."

"But in that case," objected Courtland, "it would have crashed against the sides of the stone bowl."

"Undoubtedly it would have done so, but for the speed attained in the shaft, which was probably sufficient to lift it above the edge of the bowl. For this reason we should build our car on level tracks on the top of a hill. There is a hill near my home in New Hampshire which will be perfectly suitable."

Upon Courtland devolved the work of designing their "Chariot" as they always called it. The Professor was wrapped up in the theoretical, the scientific end of the enterprise. He spent the days in the study of his cottage in the New Hampshire hills, gushing forth, like a scientific fountain, a steady stream of formulae, curves, graphs and drawings.

Meanwhile Courtland rushed back and forth from Boston with a truck they had bought and which he drove himself. Secrecy was essential. If once word of their plans leaked out, they would be overwhelmed by reporters and curiosity mongers of all sorts. That was the kind of thing they wished to avoid. Once the journey was an accomplished fact, they, or at least the Professor, would welcome all the publicity in the world. As for Courtland, it was the adventure which appealed to him. He cared nothing for the fame it would bring.

The work was carried on by foreign workmen, brought from Boston. First Courtland and the Professor selected a suitable spot in the middle of a dense clump of trees at the summit of a low hill. A roadway running east and west was cleared and the tracks laid part way down the slope, although the Professor anticipated that the chariot would leave the ground within a hundred yards of the starting point.

The chariot was to be long and streamlined, to reduce friction while passing through the atmosphere. It was to be shaped like a torpedo cut in half lengthwise, so that the bottom was practically flat. Courtland suggested and carried out a new method of construction, consisting of many layers of very thin sheet steel, alternating with asbestos. These layers were built on a rough wooden framework, and held together by rivets, none of which passed entirely through. This was to reduce the heat-conducting powers of the sides.

WHEN the asbestos-steel body was complete, the wooden framework was removed and the chariot was ready for its inner fittings.

During the evenings the two adventurers had long talks. One of the first things Courtland wanted to know was how long the journey would take.

"The motion of the chariot on leaving the surface of the earth," elucidated the Professor, "will be entirely due to the rotation of the earth on its axis. The surface of the earth in this latitude is moving at approximately 600 miles per hour. At that velocity it would take us seventeen days to reach the moon."

"That seems pretty slow traveling compared to the interplanetary journeys in fiction," objected Courtland.

"You must not overlook the fact that there is a sec-

ond factor which will greatly increase our speed. From the moment we leave the earth, that body will cease to exist, so far as any effect of gravity upon the chariot is concerned. We shall fall upon the moon with a continually accelerated velocity, just as any free body in space would fall. Our speed at any moment will be the speed of a free, falling body, plus six hundred miles per hour, which is our speed due to the centrifugal force of the earth's rotation."

"But how shall we know the exact moment to start in order to hit the moon?" asked Courtland. "With so many factors to consider, it seems a frightfully complicated problem. What with the rotation of the earth, the earth's movement in its orbit, the moon's movement in its orbit and the attraction of the moon, our chances of making connection with the Face of Isis seem pretty slim."

"The complication is only apparent," replied the Professor, "because all movement is purely relative and we are only concerned with the movement of the chariot in relation to the moon. All we have to do is start at moon-rise, when the moon is full, with the chariot pointing east; that is approximately at the lunar sphere. The chariot, affected only by its initial movement and by the attraction of the moon, will follow a curve and fall to the surface of the moon. Accuracy of aim is not a prime requisite at all."

More than once Courtland ventured to raise doubts as to the wisdom of expending so much effort without first conducting some preliminary experiments with the contents of the casket. He also suggested the advisability of calling into consultation some great authority on Egyptian hieroglyphics.

The Professor was adamant. Once convinced of the correctness of his translation, he adhered to it rigidly; neither would he tolerate the wasting of one grain of the precious powder.

"Authorities! Experiments!" he sputtered. "My authority is sufficient and experiments are unnecessary. We will stake our all on the one great experiment."

So the time passed until at last, the chariot stood ready upon its rails. It measured only sixteen feet in length and about six in diameter. The outside was painted dull black, to enable it to absorb as much heat as possible from the sun's rays. There were a number of small portholes, one of which was made removable to enable the travelers to enter, after which it could be made secure by means of bolts and a rubber gasket.

In the interior were stored the various supplies required for the trip. There was food for two months, a special form of gasoline stove for cooking and heating, together with all sorts of scientific appliances. The pointed ends of the chariot were partitioned off and filled with oxygen cylinders. There was an apparatus which the Professor had designed for purifying the air, to keep the content of carbon dioxide to a breathable percentage.

Penetrating the sides of the chariot were four curved tubes. The inner ends of these tubes were provided with airtight breeches, like torpedo tubes, into which charges of slow-burning explosive could be introduced for the purpose of controlling the movement of the

chariot in space. As the Professor pointed out, when they reached a predetermined point in their journey, it was only necessary to rotate the chariot more or less on its longitudinal axis, in order to reduce its speed to any amount desired. They would land on the moon "upside down," so that the gravity screen would not counteract the attraction of the lunar mass. When they wished to return, they would simply roll the chariot over on its base, and they would be off.

Most important of all was the equipment for handling the anti-gravitational powder itself. There was a false floor in the chariot and under this were a series of flat trays containing the powder. A most ingenious arrangement, designed by the Professor and carried out by Courtland himself, allowed the trays to be flooded with sulphuric acid by simply closing a switch. Thus the gravity screen would take effect over the whole floor uniformly and there would be no danger of an upset at the start.

On March 27th, just five months from the day when they had set sail on their voyage to Morocco, all preparations were complete. Everything that human ingenuity could devise to insure the success of the undertaking had been done. There remained only one thing. Would the mysterious powder acquire the properties they believed? Or was the old high priest playing a joke on them?

Courtland was for trying their fate at once, but the Professor urged that they should wait until the night of the full moon.

"The moon will be full on April 1st," he said. "By waiting until then, the moon, earth and sun will be in line, and there will be very little chance of the superior attraction of the sun diverting us from our course."

"Well, I'm not particularly keen to investigate the solar granulations at close quarters," Courtland said, "But it seems like tempting fate to start on a day like that. I'm not superstitious, but April 1st! I suppose we're a couple of fools, but that seems like rubbing it in!"

The fateful day dawned clear and bright, a glory of blue and green and gold. Nature went about her business as usual, quite unperturbed by the threatened invasion of her planetary sanctuaries. When Courtland walked up the hill to make a last inspection of the chariot, he tried in vain to conjure up sentiments appropriate to the occasion. He thought of the dramatic effect, with which Verne described the emotions of the three adventurers shut up in the projectile, as they waited for the pressure of a button to blast them into space. He felt that on the eve of such an unprecedented adventure, he too, should experience a great spiritual uplift or depression, a flood of anticipation or fear.

He tried in vain to bring his mind into the state which all writers of fiction regard as indispensable to such a time. But somehow, it wouldn't do! His reason told him that in less than twelve hours he would be hurled into space, but his instincts simply refused to believe his reason. This day was just like any other. The sun shone, the birds sang, the wind whispered in the leaves. Everything was as

usual except the gloomy shadow among the trees on the hill top, that black mass crouching like a devilish insect, or like an overgrown and misshapen slug.

CHAPTER VI

The Flight of the Chariot

AFTER lunch, the two men made their final arrangements. No one knew of their rash plan. The Austrian mechanics had returned to town three days before. The Professor had given his housekeeper a few days holiday to visit her daughter in a near-by village. All personal matters had been arranged with a view to the possibility of disaster. Neither Courtland nor the Professor had any near relatives to mourn them if they should never return.

At five o'clock they left the house and walked to their chariot, the vehicle in which they hoped to accomplish what their ancient Egyptian forerunner had attempted so many generations ago. Courtland helped the Professor through the open porthole and followed him. They swung the heavy glass door into place and secured it with the bolts provided for that purpose. As Courtland tightened the nuts, he found himself wondering if he would ever loosen them again or whether another hour would find the chariot bearing two more corpses into space to join the frozen body of Kut-Amen-Pash.

The Professor started the oxygen apparatus and the carbon dioxide absorber. There was nothing more they could do. Their preparations were complete to the smallest detail. Nine minutes had still to elapse before the moon rose.

They took their places side by side in the center of the chariot. Two heavy handles were bolted to the sides, to be gripped at the moment of departure, thus counteracting any possible shock, although the Professor believed that no such shock would be experienced.

Through the front port, Courtland could see a little circle, the upper half, sky, crimson with the reflected light of the setting sun; the lower half, the hazy green of the distant horizon. It struck Courtland that this semi-circle of green was perhaps his last vision of the earth.

Suddenly the upper edge of the green was cut by a tiny dot of gleaming silver. It was the moon, keeping her tryst with her would-be explorers. They would wait until the horizon bisected the disk. Slowly the Face of Isis was unveiled to the gaze of her modern worshippers.

Sixty seconds more. The Professor turned and met Courtland in a long handclasp. Then the two men grasped the handles. The Professor's left hand rested on the switch which would release the acid and start them on their flight. Courtland's eyes were on the swinging chronometer and he counted off the seconds aloud.

"Six. Five. Four. Three. Two. One. GO!"

There was a slight hissing as the sulphuric acid flooded the trays beneath the floor. For an instant nothing happened. Then there was a rending, crashing roar. The chariot rocked and trembled as if under the impact

of a terrific bombardment. Courtland was hurled to the floor. His head came into violent contact with a box of supplies and he lost consciousness.

When Courtland came to his senses, it was with a terrible feeling of physical oppression, unlike anything he had ever experienced. He was lying on his face and for a moment he thought that something must have fallen upon him from above; some tremendous weight which had pinned him to the floor. He struggled vainly to raise himself to his knees.

There was no sensation of movement, but he knew that there would be no such sensation if the chariot were flying through space, no matter what the velocity. He wondered whether this pitiless pressure that was crushing him was due to the swift acceleration of their fall toward the moon.

He managed to turn his head to one side and saw the outline of the Professor's body lying where he had fallen.

"Hello, Professor! We seem to have started. Are you all right?"

There was no answer. Courtland struggled to pull himself along the floor but finally gave up the attempt in exhaustion. He felt no pain, but his entire body seemed paralyzed.

The interior of the chariot was dark, save that a faint light filtered through the portholes on one side. Courtland determined that he would make one mighty effort to raise himself to the level of the nearest opening. Bracing his muscles, he succeeded in getting to his hands and knees. For a few seconds he maintained this position. It was as though he were Atlas struggling to uphold the world on his shoulders. His brain swam with agony.

Then his straining muscles gave way, and he was hurled forward once more into unconsciousness.

WHEN he came to himself for the second time, it was to hear the Professor giving voice to a most choice and unscholastic assortment of profanity. The little man was stamping up and down the floor of the chariot, cursing everything and everyone from Osrah the High Priest to the entire cosmic universe.

Courtland sat up and stared at the Professor in amazement. The mysterious paralysis had departed and so had the darkness. The little room was flooded with sunlight and lurid with expletives.

"Why, Professor, what on earth's the matter?" stammered Courtland, "have we missed the moon or something?"

"Matter? You may well ask what on earth's the matter!" raved the Professor, furiously. "Everything on earth's the matter! Missed the moon? No, we haven't missed the moon! We've never had a chance to miss the confounded thing! We've never started!"

"Never started!" yelled Courtland, jumping to his feet and rushing to the porthole.

He looked out, not on the empty abyss of interplanetary space or the barren wastes of a frozen lunar landscape, but on the gracious verdure of a New Hampshire hillside. The sun shone, the birds sang, the wind stirred amongst the leaves as it had done on the day be-

fore. The chariot still rested on its rails at the summit of the hill! Everything was unchanged.

No, not quite everything, for the clump of trees which had surrounded and hidden the interplanetary vessel, was levelled to the ground as though by a mighty hurricane. The chariot was almost buried by a tangled mass of trunks and branches. It was only due to the staunch construction of laminated steel and asbestos that the two adventurers had not been crushed to death by the falling timber.

So their high hopes had ended in failure. The magic powder in the golden casket was nothing but a huge fiasco, a practical joke brought to its conclusion after three thousand years, on the first of April! And yet the powder must have possessed some strange properties, after all. *Something* must have occurred when the acid mingled with it in the trays. What was it that had hurled them into unconsciousness? What was it that had produced Courtland's extraordinary paralysis? What had uprooted those great trees and flung them down upon the chariot?

To these questions and many others like them, they could find no answer. Afterwards, when an analysis of the residue in the trays revealed nothing more mysterious than magnesium sulphate, they were no nearer a solution than before. The white, crystalline contents of the trays might serve mankind in homely ways, but as an aid to the conquest of the universe, were valueless.

Professor Wadsworth, crushed and crestfallen, buried himself in his studies of the Mexican Settlement. Courtland returned to Boston and devoted himself to business. A year later Courtland received a heavy express package, which on being opened, was found to contain the golden casket. In the casket was a thick manuscript and this letter:

My dear Courtland:

To you, my favorite pupil and companion in adventure, I am sending the manuscript of my book, "A History of the Egyptian Migration in the Fifth and Sixth Dynasties." This work, the carefully thought-out result of my investigations and studies, I beg that you will publish. I have placed a sum at your disposal sufficient to cover the cost of publication. Should any profits accrue from the sale of the book, you will place the same at the disposal of the Peabody Museum for the purpose of improving the Egyptian and Mexican collections. May I impose upon your friendship to do me this last favor?

I am sailing for Mexico tomorrow. While there, I hope to find traces of the landing of that expedition which, I firmly believe, set sail from the Moroccan coast, ninety generations ago, leaving behind the body of the High Priest to guard the temple whence their leader had departed on his ill-advised attempt to set his all-conquering foot upon the Face of Isis.

Do I still believe the truth of the inscription on the casket, you ask? Yes, most emphatically I do! My dear boy, I have a confession of weakness to make. Only two months after our miserable failure, I discovered the explanation of what took place. It was I, I alone in

my self-satisfied ignorance, who was responsible for casting away the greatest opportunity ever vouchsafed to man. But what is the use of crying over spilt milk?

As I was saying, two months after we parted, I was visiting Dr. John Plattmore in New York. Dr. Plattmore, as you know, is the greatest living authority on Egyptian hieroglyphics. One evening, while we were discussing the probable extent of chemical knowledge in the Fifth Dynasty, I happened to mention solvents and particularly sulphuric acid.

"But, my dear Professor," exclaimed Plattmore, "the inorganic acids are a comparatively modern discovery. It is quite certain that nothing was known of them at the period we are discussing."

I drew the symbols which I had read as "sulphuric acid," in translating the inscription on the casket and asked the Doctor how he would interpret them.

"Literally, of course, they mean 'The fleshburner' or 'that which destroys the flesh,' but there is no doubt that they refer to one of the caustic alkalies; the hydroxides of either potassium or sodium. The Egyptian priests must have been familiar with these substances and the methods of extracting them from wood ashes and sea-weed."

With the Doctor's words came a flood of enlightenment. I realized the cause of our failure, and the reasons for the extraordinary phenomena which accompanied it. As you are fully aware, acids and alkalis are directly opposite in their chemical reactions. Presuming that the powder in the casket acquired antigravitational properties by the addition of an alkali, what would take place as the result of adding an acid?

Why, the area covered by the powder would become tremendously permeable to gravity, just as the presence of a piece of iron increases the permeability of a magnetic field. In simple words, the force of gravity would be many times multiplied. Our weight, increased from its normal value to, perhaps, half a ton or more, crushed us to the floor and rendered us helpless. The trees which stretched their branches above the chariot were unable to resist the strain of their own weight and came crashing down upon us, rending their roots from the ground.

You will ask, my dear Courtland, why an analysis of the residue failed to reveal the presence of any strange substance. I have no doubt that the original powder was a compound of magnesium with some unknown element. The latter, which should have been rendered opaque to gravity under the action of an alkali, passed off in gas by combination with the hydrogen of the acid. So long as the gas remained in the trays our weight was enormously increased, but during our period of unconsciousness, this gas leaked away and its effect was destroyed.

I should have told you this long ago, but in my fallen pride, I was ashamed to admit that our failure was due to my unwillingness to consult a higher authority than myself. Forgive me if you can, but believe me, my dear Courtland, your old friend and fellow student,

MYRON B. WADSWORTH.

The WORM

By David H. Keller, M.D.

Author of: "The Psychological Experiment," "The Psychophonic Nurse," etc.



He was just in time. The floor, cut through, disappeared into the Thing's maw and with it the red hot stove. Staples yelled in his glee, "A hot pill for you this time, a HOT PILL."

THE miller patted his dog on the head, as he whispered: "We are going to stay here. Our folks, your ancestors and mine, have been here for nearly two hundred years, and queer it would be to leave now because of fear."

The grist mill stood, a solid stone structure, in an isolated Vermont valley. Years ago every day had been a busy one for the mill and the miller, but now only the mill wheel was busy. There was no grist for the mill and no one lived in the valley. Blackberries and hazel grew where once the pastures had been green. The hand of time had passed over the farms and the only folk left were sleeping in the churchyard. A family of squirrels nested in the pulpit, while on the tombstones silent snails left their cryptic messages in silvery streaks. Thompson's Valley was being handed back to nature. Only the

old bachelor miller, John Staples, remained. He was too proud and too stubborn to do anything else.

The mill was his home, even as it had served all of his family for a home during the last two hundred years. The first Staples had built it to stay, and it was still as strong as on the day it was finished. There was a basement for the machinery of the mill, the first floor was the place of grinding and storage and the upper two floors served as the Staples' homestead. The building was warm in winter and cool in summer. Times past it had sheltered a dozen Staples at a time; now it provided a home for John Staples and his dog.

He lived there with his books and his memories. He had no friends and desired no associates. Once a year he went to the nearest town and bought supplies of all kinds, paying for them in gold. It was supposed that he was wealthy. Rumor credited him with being a miser. He attended to his own business,

*D*R. KELLER can always be relied upon to do the unusual. In the present instance he certainly did step forward with one of the most unusual stories that you have ever read. It is one of those stories that would do honor to Edgar Allan Poe.

If you believe that creatures such as described by Dr. Keller are impossible, all you have to do is to look up the size of a dinosaur or other reptiles of past ages. And for that matter, the bulk of the present day whale is so large that you could easily make thirty-seven full grown elephants from its bulk.

asked the world to do the same, and on a winter's evening laughed silently over Burton and Rabalais, while his dog chased rabbits in his heated sleep upon the hearth.

The winter of 1935 was beginning to threaten the valley, but with an abundance of food and wood in the mill, the recluse looked forward to a comfortable period of desuetude. No matter how cold the weather, he was warm and contented. With the inherent ability of his family, he had been able to convert the water power into electricity. When the wheel was frozen, he used the electricity stored in his storage batteries. Every day he puttered around among the machinery which it was his pride to keep in perfect order. He assured the dog that if business ever did come to the mill, he would be ready for it.

It was on Christmas Day of that winter that he first heard the noise. Going down to the basement to see that nothing had been injured by the bitter freeze of the night before, his attention was attracted, even while descending the stone steps, by a peculiar grinding noise, that seemed to come from out of the ground. His ancestors, building for permanency, had not only put in solid foundations, but had paved the entire basement with slate flagstones three feet wide and as many inches thick. Between these the dust of two centuries had gathered and hardened.

Once his feet were on this pavement, Staples found that he could not only hear the noise, but he could also feel the vibrations which accompanied it through the flagstones. Even through his heavy leather boots he could feel the rhythmic pulsations. Pulling off his mittens, he stooped over and put his finger tips on the stone. To his surprise it was warm in spite of the fact that the temperature had been below zero the night before. The vibration was more distinct to his finger tips than it had been to his feet. Puzzled, he threw himself on the slate stone and put his ear to the warm surface.

The sound he now heard made him think of the grinding of the mill stones when he was a boy and the farmers had brought corn to be ground into meal. There had been no corn-meal ground in the mill for fifty years, yet here was the sound of stone scraping slowly and regularly on stone. He could not understand it. In fact it was some time before he tried to explain it. With the habit born of years of solitary thinking, he first collected all the available facts about this noise. He knew that during the long winter evenings he would have time enough to do his thinking.

Going to his sitting room, he secured a walking stick of ash and went back to the cellar. Holding the handle of the cane lightly, he placed the other end on a hundred different spots on the floor, and each time he held it long enough to determine the presence or absence of vibration. To his surprise he found that while it varied in strength, it was present all over the cellar with the exception of the four corners. The maximum intensity was about in the center.

That evening he concentrated on the problem before him. He had been told by his grandfather, that the

mill was built on solid rock. As a young man he had helped clean out a well near the mill and recalled, that instead of being dug out of gravel or dirt, it had the appearance of being drilled out of solid granite. There was no difficulty in believing that the earth under the mill was also solid rock. There was no reason for thinking otherwise. Evidently some of these strata of stone had become loose and were slipping and twisting under the mill. The simplest explanation was the most reasonable: it was simply a geological phenomenon. The behavior of the dog, however, was not so easily explained. He had refused to go with his master into the cellar, and now, instead of sleeping in comfort before the fire, he was in an attitude of strained expectancy. He did not bark, or even whine, but crept silently to his master's chair, looking at him anxiously.

THE next morning the noise was louder. Staples heard it in his bed, and at first he thought that some bold adventurer had come into the forest and was sawing down a tree. That was what it sounded like, only softer and longer in its rhythm. Buzzzzzz—Buzzzzzzzzzz—Buzzzzzzzzzz. The dog, distinctly unhappy, jumped up on the bed and crawled uneasily so he could nuzzle the man's hand.

Through the four legs of the bed, Staples could feel the same vibration that had come to him through the handle of his cane the day before. That made him think. The vibration was now powerful enough to be appreciated, not through a walking stick, but through the walls of the building. The noise could be heard as well on the third floor as in the cellar.

He tried to fancy what it sounded like—but what it was—but what it was like. The first idea had been that it resembled a saw going through oak; then came the thought of bees swarming, only these were large bees and millions of them; but finally all he could think of was the grinding of stones in a grist mill, the upper stone against the lower; and now the sound was Grrrrrrrrrr—Grrrrrrrrrr instead of Buzzzzzzzzzz or Hummmmmmm.

That morning he took longer than usual to shave and was more methodical than was his wont in preparing breakfast for himself and the dog. It seemed as though he knew that sometime he would have to go down into the cellar but wanted to postpone it as long as he could. In fact, he finally put on his coat and beaver hat and mittens and walked outdoors before he went to the basement. Followed by the dog, who seemed happy for the first time in hours, he walked out on the frozen ground and made a circle around the building he called his home. Without knowing it, he was trying to get away from the noise, to go somewhere he could walk without feeling that peculiar tingling.

Finally he went into the mill and started down the steps to the cellar. The dog hesitated on the top step, went down two steps and then jumped back to the top step, where he started to whine. Staples went steadily down the steps, but the dog's behavior did not add to his peace of mind. The noise was much louder than

it was the day before, and he did not need a cane to detect the vibration—the whole building was shaking. He sat down on the third step from the bottom and thought the problem over before he ventured out on the floor. He was especially interested in an empty barrel which was dancing around the middle of the floor.

The power of the mill-wheel was transferred through a simple series of shafts, cogs and leather belting to the grinding elements on the first floor. All this machinery for transmitting power was in the basement. The actual grinding had been done on the first floor. The weight of all this machinery, as well as of the heavy millstones on the first floor, was carried entirely by the flooring of the basement. The ceiling of the first floor was built on long pine beams which stretched across the entire building and were sunk into the stone walls at either side.

Staples started to walk around on the slate flagstones when he observed something that made him decide to stay on the steps. The floor was beginning to sink in the middle; not much, but enough to cause some of the shafts to separate from the ceiling. The ceiling seemed to sag. He saw that light objects like the empty barrel were congregating at the middle of the cellar. There was not much light but he was easily able to see that the floor was no longer level; that it was becoming saucer-shaped. The grinding noise grew louder. The steps he sat on were of solid masonry, stoutly connected with and a part of the wall. These shared in the general vibration. The whole building began to sing like a 'cello.

One day he had been to the city and heard an orchestra play. He had been interested in the large violins, especially the one that was so large the player had to stay on his feet to play it. The feeling of the stone step under him reminded him of the notes of this violin the few times it had been played by itself. He sat there. Suddenly he started, realizing that in a few more minutes he would be asleep. He was not frightened but in some dim way he knew that he must not go to sleep—not here. Whistling, he ran up the steps to get his electric torch. With that in his hand, he went back to the steps. Aided by the steady light, he saw that several large cracks had appeared in the floor and that some of the stones, broken loose from their fellows, were moving slowly in a drunken, meaningless way. He looked at his watch. It was only a little after nine.

And then the noise stopped.

No more noise! No more vibration! Just a broken floor and every bit of the machinery of the mill disabled and twisted. In the middle of the floor was a hole where one of the pavement stones had dropped through. Staples carefully walked across and threw the light down this hole. Then he lay down and carefully put himself in such a position that he could look down the hole. He began to sweat. There did not seem to be any bottom!

Back on the solid steps he tried to give that hole its proper value. He could not understand it, but he did not need the whining of the dog to tell him what to

do. That door must be closed as soon as possible.

LIKE a flash the method of doing so came to him. On the floor above he had cement. There were hundreds of grain sacks. Water was plentiful in the mill race. All that day he worked, carefully closing the hole with a great stopper of bags and wire. Then he placed timbers above and finally covered it all with cement, rich cement. Night came and he still worked. Morning came and still he staggered down the steps, each time with a bag of crushed stone, or cement on his shoulder or with two buckets of water in his hands. At noon the next day the floor was no longer concave but convex. On top of the hole was four feet of timbers, bags and concrete. Then and only then did he go and make some coffee. He drank it, cup after cup, and slept.

The dog stayed on the bed at his feet.

When the man awoke, the sun was streaming in through the windows. It was a new day. Though the fire had long since died out, the room was warm. Such days in Vermont were called weather breeders. Staples listened. There was no sound except the ticking of his clock. Not realizing what he was doing, he knelt by the bed, thanked God for His mercies, jumped into bed again and slept for another twenty-four hours. This time he awoke and listened. There was no noise. He was sure that by this time the cement had hardened. This morning he stayed awake and shared a Gargantuan meal with the dog. Then it seemed the proper thing to go to the basement. There was no doubt that the machinery was a wreck but the hole was closed. Satisfied that the trouble was over, he took his gun and dog and went hunting.

When he returned, he did not have to enter the mill to know that the grinding had begun again. Even before he started down the steps he recognized too well the vibration and the sound. This time it was a melody of notes, a harmony of discords, and he realized that the thing, which before had cut through solid rock, was now wearing its way through a cement in which were bags, timbers and pieces of iron. Each of these gave a different tone. Together they all wailed over their dissolution.

Staples saw, even with the first glance, that it would not be long before his cement "cork" would be destroyed. What was there to do next? All that day when hunting, his mind had been dimly working on that problem. Now he had the answer. He could not cork the hole, so he would fill it with water. The walls of the mill were solid, but he could blast a hole through them and turn the mill race into the cellar. The race, fed by the river, took only a part of what it could take, if its level were rapidly lowered. Whatever it was that was breaking down the floor of the mill could be drowned. If it were alive, it could be killed. If it was fire, it could be quenched. There was no use to wait until the hole was again opened. The best plan was to have everything ready. He went back to his kitchen and cooked a meal of ham and eggs. He ate all he could. He boiled a pot of coffee. Then he started to work. The wall reached three feet down

below the surface. A charge of powder, heavy enough to break through, would wreck the whole building, so he began to peck at the wall, like a bird pecking at a nut. First a period of drilling and then a little powder and a muffled explosion. A few buckets of loosened rock. Then some more drilling and another explosion. At last he knew that only a few inches of rock lay between the water and the cellar.

All this time there had been a symphony of noises, a disharmony of sounds. The constant grinding came from the floor, interrupted with the sound of sledge or crowbar, dull explosion of powder and crashing of rock, fragments on the floor. Staples worked without stop save to drink his coffee. The dog stood on the upper steps.

Then without warning the whole floor caved in. Staples jumped to the steps. These held. On the first day there had been a hole a few feet wide. Now the opening nearly occupied the entire area of the floor. Staples, nauseated, looked down to the bottom. There, about twenty feet below him, a mass of rocks and timbers churned in a peculiar way, but all gradually disappeared in a second hole, fifteen feet wide. Even as he looked they all disappeared in this median hole.

The opening he had been breaking in the wall was directly across from the steps. There was a charge of powder there but no way of going across to light the fuse. Still there was no time to lose and he had to think fast. Running to the floor above he picked up his rifle and went to the bottom of the steps. He was able to throw the beam from his search light directly into the hole in the wall. Then he shot—once—twice and the third time the explosion told him he had succeeded.

The water started to run into the cellar. Not fast at first but more rapidly as the mud and weeds were cleared out. Finally an eight-inch stream flowed steadily into the bottomless hole. Staples sat on the bottom steps. Soon he had the satisfaction of seeing the water fill the larger hole and then cover the floor, what there was left of it. In another hour he had to leave the lower steps. He went out to the mill race and saw that there was still enough water to fill a hundred such holes. A deep sense of satisfaction filled his weary mind.

And again, after eating, he sought sleep.

WHEN he awoke, he heard the rain angrily tapping at the windows with multifingers. The dog was on the woven rug by the side of the bed. He was still restless and seemed pleased to have his master awake. Staples dressed more warmly than usual and spent an extra half hour making pancakes to eat with honey. Sausages and coffee helped assuage his hunger. Then with rubber boots and a heavy raincoat, he went out into the valley. The very first thing that he noticed was the mill race. It was practically empty. The little stream of water at the bottom was pouring into the hole he had blasted into the stone wall hours before. The race had contained eight feet of water. Now barely six inches remained, and the dread came to the man that the hole in the cellar was not only emptying the

race but was also draining the little river that for thousands of years had flowed through the valley. It had never gone dry. He hastened over to the dam and his worst fears were realized. Instead of a river, there was simply a streak of mud with cakes of dirty ice, all being washed by the torrent of rain. With relief he thought of this rain. Millions of tons of snow would melt and fill the river. Ultimately the hole would fill and the water would rise again in the mill-race. Still he was uneasy. What if the hole had no bottom?

When he looked into the basement he was little reassured. The water was still going down, though slowly. It was rising in the basement and this meant that it was now running in faster than it was running down.

Leaving his coat and boots on the first floor, he ran up the stone steps to the second floor, built a fire in the living room and started to smoke—and think. The machinery of the mill was in ruins; of course it could be fixed, but as there was no more need of it, the best thing was to leave it alone. He had gold saved by his ancestors. He did not know how much, but he could live on it. Restlessly he reviewed the past week, and, unable to rest, hunted for occupation. The idea of the gold stayed in his mind and the final result was that he again put on his boots and coat and carried the entire treasure to a little dry cave in the woods about a half mile from the mill. Then he came back and started to cook his dinner. He went past the cellar door three times without looking down.

Just as he and the dog had finished eating, he heard a noise. It was a different one this time, more like a saw going through wood, but the rhythm was the same—Hrrrrrr—Hrrrrrr. He started to go to the cellar but this time he took his rifle, and while the dog went after him, he howled dismally with his tail between his legs, shivering.

As soon as Staples reached the first floor, he felt the vibration. Not only could he feel the vibration, he could see it. It seemed that the center of the floor was being pushed up. Flashlight in hand, he opened the cellar door. There was no water there now—in fact there was no cellar left! In front of him was a black wall on which the light played in undulating waves. It was a wall and it was moving. He touched it with the end of his rifle. It was hard and yet there was a give to it. Feeling the rock, he could feel it move. Was it alive? Could there be a living rock? He could not see around it but he felt that the bulk of the thing filled the entire cellar and was pressing against the ceiling. That was it! The thing was boring through the first floor. It had destroyed and filled the cellar! It had swallowed the river! Now it was working at the first floor. If this continued, the mill was doomed. Staples knew that it was a thing alive and *he had to stop it!*

He was thankful that all of the steps in the mill were of stone, fastened and built into the wall. Even though the floor did fall in, he could still go to the upper rooms. He realized that from now on the fight had to be waged from the top floors. Going up the steps, he saw that a small hole had been cut through the oak flooring. Even as he watched, this grew larger. Trying to remain calm, realizing that only by doing so could he

retain his sanity, he sat down in a chair and timed the rate of enlargement. But there was no need of using a watch: the hole grew larger—and larger and larger—and now he began to see the dark hole which had sucked the river dry. Now it was three feet in diameter—now four feet—now six. It was working smoothly now—it was not only grinding—but *it was eating*.

Staples began to laugh. He wanted to see what it would do when the big stone grinders slipped silently down into that maw. That would be a rare sight. All well enough to swallow a few pavement stones, but when it came to a twenty ton grinder, that would be a different kind of a pill. "I hope you choke!" he cried, "Damn you! whatever you are! I hope you choke!" The walls hurled back the echo of his shouts and frightened him into silence. Then the floor began to tilt and the chair to slide toward the opening. Staples sprang toward the steps.

"Not yet!" he shrieked. "Not to-day, Elenora! Some other day, but not to-day!" and then from the safety of the steps, he witnessed the final destruction of that floor and all in it. The stones slipped down, the partitions, the beams, and then, as though satisfied with the work and the food, the Thing dropped down, down, down and left Staples dizzy on the steps looking into a hole, dark, deep, coldly bottomless surrounded by the walls of the mill, and below them a circular hole cut out of the solid rock. On one side a little stream of water came through the blasted wall and fell, a tiny waterfall, below. Staples could not hear it splash at the bottom.

Nauseated and vomiting, he crept up the steps to the second floor, where the howling dog was waiting for him. On the floor he lay, sweating and shivering in dumb misery. It took hours for him to change from a frightened animal to a cerebrating god, but ultimately he accomplished even this, cooked some more food, warmed himself and slept.

AND while he dreamed, the dog kept sleepless watch at his feet. He awoke the next morning. It was still raining, and Staples knew that the snow was melting on the hills and soon would change the little valley river into a torrent. He wondered whether it was all a dream, but one look at the dog showed him the reality of the last week. He went to the second floor again and cooked breakfast. After he had eaten, he slowly went down the steps. That is, he started to go, but halted at the sight of the hole. The steps had held and ended on a wide stone platform. From there another flight of steps went down to what had once been the cellar. These two flights of steps clinging to the walls had the solid stone mill on one side, but on the inside they faced a chasm, circular in outline and seemingly bottomless; but the man knew there was a bottom and from that pit the Thing had come—and would come again.

That was the horror of it! He was so certain that it would come again. Unless he was able to stop it. How could he? Could he destroy a Thing that was able to bore a thirty foot hole through solid rock, swallow a river and digest grinding stones like so many pills?

One thing he was sure of—he could accomplish nothing without knowing more about it. To know more, he had to watch. He determined to cut a hole through the floor. Then he could see the Thing when it came up. He cursed himself for his confidence, but he was sure it would come.

It did. He was on the floor looking into the hole he had sawed through the plank, and he saw it come: but first he heard it. It was a sound full of slithering slidings, wrathful rasping of rock against rock—but, no! That could not be, for this Thing was alive. Could this be rock and move and grind and eat and drink? Then he saw it come into the cellar and finally to the level of the first floor, and then he saw its head and face.

The face looked at the man and Staples was glad that the hole in the floor was as small as it was. There was a central mouth filling half the space; fully fifteen feet in diameter was that mouth, and the sides were ashen gray and quivering. There were no teeth.

That increased the horror: a mouth without teeth, without any visible means of mastication and yet Staples shivered as he thought of what had gone into that mouth, down into that mouth, deep into the recesses of that mouth and disappeared. The circular lip seemed made of scales of steel, and they were washed clean with the water from the race.

On either side of this gigantic mouth was an eye, lidless, browless, pitiless. They were slightly withdrawn into the head so the Thing could bore into that rock without injuring them. Staples tried to estimate their size: all he could do was to avoid their baleful gaze. Then even as he watched the mouth closed and the head began a semicircular movement, so many degrees to the right, so many degrees to the left and up—and up—and finally the top touched the bottom of the plank Staples was on and then Hrrrrrr—Hrrrrrr and the man knew that it was starting upon the destruction of the second floor. He could not see now as he had been able to see before, but he had an idea that after grinding a while the Thing opened its mouth and swallowed the débris. He looked around the room. Here was where he did his cooking and washing and here was his winter supply of stove wood. A thought came to him.

WORKING frantically, he pushed the center burner to the middle of the room right over the hole he had cut in the floor. Then he built a fire in it, starting it with a liberal supply of coal-oil. He soon had the stove red hot. Opening the door he again filled the stove with oak and then ran for the steps. He was just in time. The floor, cut through, disappeared into the Thing's maw and with it the redhot stove. Staples yelled in his glee, "A hot pill for you this time, a HOT PILL!"

If the pill did anything, it simply increased the desire of the Thing to destroy, for it kept on till it had bored a hole in this floor equal in size to the holes in the floors below it. Staples saw his food, his furniture, the ancestral relics disappear into the same opening that had consumed the machinery and mill supplies.

On the upper floor the dog howled.

The man slowly went up to the top floor, and joined the dog, who had ceased to howl and began an uneasy whine. There was a stove on this floor, but there was no food. That did not make any difference to Staples: for some reason he was not hungry any more: it did not seem to make any difference—nothing seemed to matter or make any difference any more. Still he had his gun and over fifty cartridges, and he knew that at the last, even a Thing like that would react to bullets in its eye balls—he just knew that nothing could withstand that.

He lit the lamp and paced the floor in a cold, careless mood. One thing he had determined. He said it over and over to himself.

"This is my home. It has been the home of my family for two hundred years. No devil or beast or worm can make me leave it."

He said it again and again. He felt that if he said it often enough, he would believe it, and if he could only believe it, he might make the Worm believe it. He knew now that it was a Worm, just like the night crawlers he had used so often for bait, only much larger. Yes, that was it. A worm like a night crawler, only much larger, in fact, very much larger. That made him laugh—to think how much larger this worm was than the ones he had used for fishing. All through the night he walked the floor and burned the lamp and said, "This is my home. No worm can make me leave it!" Several times he went down the steps, just a few of them, and

shouted the message into the pit as though he wanted the Worm to hear and understand, "This is my home! NO WORM CAN MAKE ME LEAVE IT!"

Morning came. He mounted the ladder that led to the trap door in the roof and opened it. The rain beat in. Still that might be a place of refuge. Crying, he took his Burton and his Rabalais and wrapped them in his rain coat and put them out on the roof, under a box. He took the small pictures of his father and mother and put them with the books. Then in loving kindness he carried the dog up and wrapped him in a woolen blanket. He sat down and waited, and as he did so he recited poetry—anything that came to him, all mixed up, "Come into the garden where there was a man who was so wondrous wise, he jumped into a bramble bush and you're a better man than I am and no one will work for money and the King of Love my Shepherd is"—and on—and then—

He heard the sliding and the slithering rasping and he knew that the Worm had come again. He waited till the Hrrrrr-Hrrrrr told that the wooden floor he was on was being attacked and then he went up the ladder. It was his idea to wait till the Thing had made a large opening, large enough so the eyes could be seen and then use the fifty bullets—where they would do the most good. So, on the roof, beside the dog, he waited.

He did not have to wait long. First appeared a little hole and then it grew wider and wider till finally the entire floor and the furniture had dropped into the mouth, and the whole opening, thirty feet wide and more than

Ralph 124C 41 +

By Hugo Gernsback

RALPH 124C 41 + first appeared as a serial in the author's first magazine, "Modern Electrics," in 1911. This magazine was the first devoted exclusively to radio activities. At the time the story was written the word "radio" had not yet come into use. We were at that time still using the term "wireless." It has been necessary, in view of scientific progress since the time the story was written, and in order to present the book to a much wider reading public, to rewrite much of the story and to make many changes. Yet, the ideas and conceptions embodied in the original manuscript have been little altered.

The author appreciates that many of the predictions and statements appear to verge upon the fantastic. This was the case with Jules Verne's submarine "Nautilus" in his famous story "Twenty Thousand Leagues Under the Sea." Verne's conception of the submarine was declared utterly ridiculous. Nevertheless, the prophecy was fulfilled. In fact, Verne's imagination hit far below the mark in what was actually accomplished by science since the book was written.

Lest you think that the author has gone too far into the realms of pure imagination, place yourself in the position of your great-great-grandfather imagining that he is told about locomotives, steamships, X-rays, telegraphs, telephones, phonographs, electric lights, radio broadcasting, and the hundred other commonplaces of our lives today. Would he not have condemned such predictions as the height of folly and absurdity?

So with you. You are in the same position with respect to the prophecies in this work as your remote ancestor.

Your descendants, picking up this book 750 years hence, or at the time in which this story is laid, will ridicule the author for his lack of imagination in failing to conceive the obvious developments in the first half of the next century.

It may be of passing interest to note that several of the predictions made by the author when this story was written have already become verities. Notable among these is what the author termed the Hypnobioscope, the purpose of which was to acquire knowledge while asleep. The author was greatly astonished to read the results obtained by J. A. Phinney, Chief Radioman, U. S. Navy, who, having tried the system himself, in 1923, introduced it at the Pensacola, Florida, Naval Training School. Here one may see naval students stretched out on long benches asleep with basket-like coverings over their heads. The baskets contain two telephone receivers through which radio code is sent to the sleeper. It has been demonstrated that the sleeping student can be taught code faster in this way than by any other means, for the sub-conscious self never sleeps. Students who have failed in their studies have passed examinations after being taught by this method.

The scientific conception or vision of the world of 750 years hence, represents the author's projection of the scientific knowledge of today. Scientific progress is moving at an accelerating pace, and if that pace is maintained, it seems fair to assume that the conceptions herein described will, 750 years hence, be found to have fallen far short of the actual progress made in the interim.

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now on sale on the newsstands

that, was filled with the head, the closed mouth of which came within a few feet of the roof. By the aid of the light from the trap door, Staples could see the eye on the left side. It made a beautiful bull's eye, a magnificent target for his rifle and he was only a few feet away. He could not miss. Determined to make the most of his last chance to drive his enemy away, he decided to drop down on the creature, walk over to the eye and put the end of the rifle against the eye before he fired. If the first shot worked well, he could retire to the roof and use the other cartridges. He knew that there was some danger—but it was his last hope. After all he knew that when it came to brains he was a man and this thing was only a Worm. He walked over the head. Surely no sensation could go through such massive scales. He even jumped up and down. Meantime the eye kept looking up at the roof. If it saw the man, it made no signs, gave no evidence. Staples pretended to pull the trigger and then made a running jump for the trap door. It was easy. He did it again, and again. Then he sat on the edge of the door and thought.

He suddenly saw what it all meant. Two hundred years before, his ancestors had started grinding at the mill. For over a hundred and fifty years the mill had been run continuously, often day and night. The vibrations had been transmitted downward through the solid rock. Hundreds of feet below the Worm had heard them and felt them and thought it was another Worm. It had started to bore in the direction of the noise. It

had taken two hundred years to do it, but it had finished the task, it had found the place where its mate should be. For two hundred years it had slowly worked its way through the primitive rock. Why should it worry over a mill and the things within it? Staples saw then that the mill had been but a slight incident in its life. It was probable that it had not even known it was there—the water, the gristmillstones, the red hot stove, had meant nothing—they had been taken as a part of the day's work. There was only one thing that the Worm was really interested in, but one idea that had reached its consciousness and remained there through two centuries, and that was to find its mate. The eye looked upward.

Staples, at the end, lost courage and decided to fire from a sitting position in the trap door. Taking careful aim, he pulled the trigger. Then he looked carefully to see what damage had resulted. There was none. Either the bullet had gone into the eye and the opening had closed or else it had glanced off. He fired again and again.

Then the mouth opened—wide—wider—until there was nothing under Staples save a yawning void of darkness.

The Worm belched a cloud of black, nauseating vapor. The man, enveloped in the cloud, lost consciousness and fell.

The Mouth closed on him.

On the roof the dog howled.

THE END.

What Do You Know?

READERS of AMAZING STORIES have frequently commented upon the fact that there is more actual knowledge to be gained through reading its pages than from many a textbook. Moreover, most of the stories are written in a popular vein, making it possible for any one to grasp important facts.

The questions which we give below are all answered on the pages as listed at the end of the questions. Please see if you can answer the questions without looking for the answer, and see how well you check up on your general knowledge.

1. What remarkable gold beads have actually been found in South America? (See page 1066.)
2. What mysterious colossal idols are found in South America, nearly 2,000 miles from any source of the rock from which they are composed? (See page 1066.)
3. What mineral is emerald? (See page 1068.)
4. How can microscope slides be broken? What special care is needed in focussing the instrument? (See page 1070.)
5. Is tobacco annihilated when it is smoked? (See page 1071.)
6. What is the effect of a shallow focal plane in using a microscope? (See page 1077.)
7. What is the theory of ancient migrations, as regards their rate of progression on their way? (See page 1089.)
8. Describe a sistrum. What is it? What was its use? (See page 1089.)
9. Did Egyptians know or use mineral acids such as sulphuric acid? (See page 1100.)
10. Is the matter in comets of high specific gravity? (See page 1144.)
11. What mystery is there about the return of comets which is involved in the curve they follow? (See page 1144.)
12. According to the Doppler law, could the light of a moving incandescent body be completely blotted out? (See page 1146.)
13. Could the voice of an orator reach a distant city before it reached his audience? (See page 1147.)

A New Scientifiction Story The Vanguard of Venus

by Landell Bartlett

This story will not be published in any magazine but we have arranged to give it to our readers in attractive book form—ABSOLUTELY FREE. Turn to page 1135 and learn all about this big Free offer. Remember! This is the only way that you will ever be able to read this remarkable tale.

The AIRLORDS of HAN

By Philip Francis Nowlan

A Sequel to "Armageddon—2419 A. D."

CHAPTER I

The Airlords Besieged



N a previous record of my adventures in the early part of the Second War of Independence I explained how I, Anthony Rogers, was overcome by radioactive gases in an abandoned mine near Scranton in the year 1927, where I existed in a state of suspended animation for nearly five hundred years; and awakened to find that the America I knew had been crushed under the cruel tyranny of the Airlords of Han, fierce Mongolians, who, as scientists now contend, had in their blood a taint not of this earth, and who with science and resources far in advance of those of a United States, economically prostrate at the end of a long series of wars with a Bolshevik Europe, in the year 2270 A.D., had swept down from the skies in their great airships that rode "repeller rays" as a ball rides the stream of a fountain, and with their terrible "disintegrator rays" had destroyed more than four-fifths of the American race, and driven the other fifth to cover in the vast forests which grew up over the remains of the once mighty civilization of the United States.

I explained the part I played in the fall of the year 2419, when the rugged Americans, with science secretly

developed to terrific efficiency in their forest fastness, turned fiercely and assumed the aggressive against a now effete Han population, which for generations had shut itself up in the fifteen great Mongolian cities of America, having abandoned cultivation of the soil and the operation of mines; for these Hans produced all they needed in the way of food, clothing, shelter and machinery through electrono-synthetic processes.

I explained how I was adopted into the Wyoming Gang, or clan, descendants of the original populations of Wilkes-Barre, Scranton and the Wyoming Valley in Pennsylvania; how quite by accident I stumbled upon a method of destroying Han aircraft by shooting explosive rockets, not directly at the heavily armored ships, but at the repeller ray columns, which automatically drew the rockets upward where they exploded in the generators of the aircraft; how the Wyomings threw the first thrill of terror into the Airlords by bringing an

entire squadron crashing to earth; how a handful of us in a rocketship successfully raided the Han city of Nu-Yok; and how by the application of military principles, I remembered from the First World War, I was able to lead the Wyomings to victory over the Sinsings, a Hudson River tribe which had formed a traitorous alliance with the hereditary enemies and oppressors of the White Race in America.

By the Spring of 2420 A.D., a short six months after these events, the positions of the Yellow and the White Races in America had been reversed. The hunted were now the hunters. The Hans desperately were increasing the defenses of their fifteen cities, around each of which the American Gangs had drawn a widely deployed line of long-gunners; while nervous air convoys, closely bunched behind their protective screen of disintegrator beams, kept up sporadic and costly systems of transportation between the cities.

During this period our own campaign against the Hans of Nu-Yok was fairly typical of the development of the war throughout the country. Our force was composed of contingents from most of the Gangs of Pennsylvania, Jersey and New England. We encircled the city on a wide radius, our line running roughly from Staten Island to the forested site of the ancient city of Elizabeth, to First and Second Mountains just West of the ruins of Newark, Bloomfield and Montclair, thence Northeasterly across the Hudson, and down to the Sound. On Long Island our line was pushed forward to the first slopes of the hills.

We had no more than four long-gunners to the square mile in our first line, but each of these was equal to a battery of heavy artillery such as I had known in the First World War. And when their fire was first concentrated on the Han city, they blew its outer walls and roof levels into a chaotic mass of wreckage before the nervous Yellow

engineers could turn on the ring of generators which surrounded the city with a vertical film of disintegrator rays. Our explosive rockets could not penetrate this film, for it disintegrated them instantly and harmlessly, as it did all other material substance with the sole exception of "inerttron," that synthetic element developed by the Americans from the sub-electronic and ultronic orders.

The continuous operation of the disintegrators de-

IF you have read "Armageddon—2419 A.D."—and we are sure you have—you may have a slight idea what is in store for you in the present sequel.

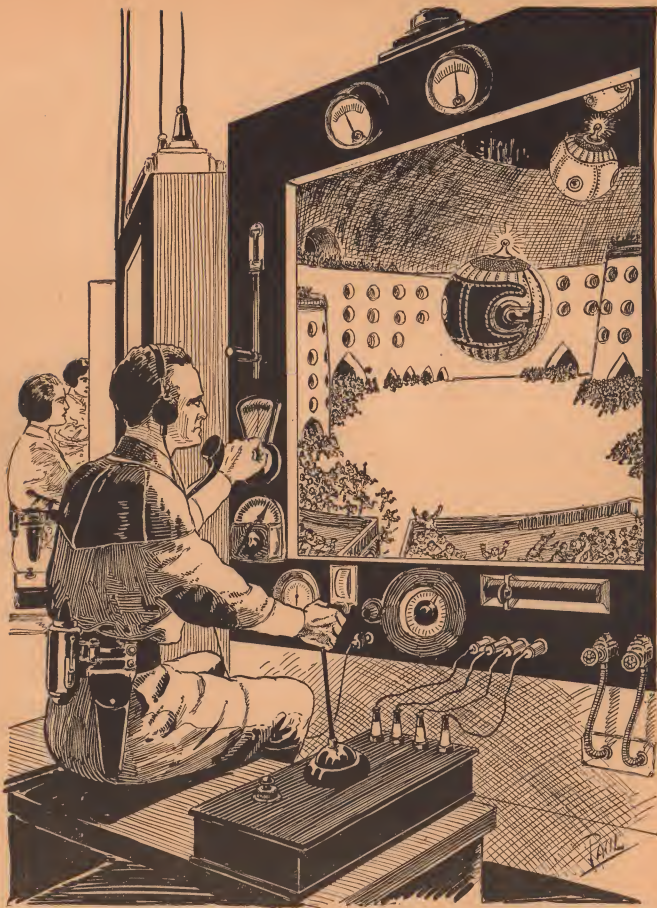
Mr. Nowlan has quite outdone himself. In our humble opinion, the sequel is in many respects better than the original story.

We hope that will be your verdict also.

Like the first story, this one is pregnant with adventure, mystery and science to an unusual degree for stories of this kind.

Apparently Mr. Nowlan has developed an entirely new technique in inventing new and amazing instrumentalities, and indeed, wholly new branches of science itself, particularly science as applied to warfare. And no matter how fast a thinker and no matter how good a scientist you are, you will find that the author is always a few steps ahead of you and anticipates your own thoughts nine times out of ten.

It is a capital story which you will enjoy all the way through.



It emerged into the great vaulted excavation, capable of holding a thousand or more persons, from which the various escape tunnels radiated. Down these tunnels the last remnants of a crowd of fugitives were disappearing.

stroyed the air and maintained a constant vacuum wherever they played, into which the surrounding air continuously rushed, naturally creating atmospheric disturbances after a time, which resulted in a local storm. This, however, ceased after a number of hours, when the flow of air toward the city became steady.

The Hans suffered severely from atmospheric conditions inside their city at first, but later rearranged their disintegrator ring in a system of overlapping films that left diagonal openings, through which the air rushed to them, and through which their ships emerged to scout our positions.

We shot down seven of their cruisers before they realized the folly of floating individually over our invisible line. Their beams traced paths of destruction like scars across the countryside, but caught less than half a dozen of our gunners all told, for it takes a lot of time to sweep every square foot of a square mile with a beam whose cross section is not more than twenty or twenty-five feet in diameter. Our gunners, completely concealed beneath the foliage of the forest, with weapons which did not reveal their position, as did the flashes and detonation of the twentieth century artillery, hit their repeller rays with comparative ease.

The "drop ships," which the Hans next sent out, were harder to handle. Rising to immense heights behind the city's disintegrator wall, these tiny, projectile-like craft slipped through the rifts in the cylinder of destruction, and then turning off their repeller rays, dropped at terrific speed until their small vanes were sufficient to support them as they whirled in great circles, shooting back into the city defenses at a lower level.

The great speed of these craft made it almost impossible to register a direct hit against them with rocket guns, and they had no repeller rays at which we might shoot while they were over our lines.

But by the same token they were able to do little damage to us. So great was the speed of a drop ship, that the only way in which it could use a disintegrator ray was from a fixed generator in the nose of the structure, as it dropped in a straight line toward its target. But since they could not sight the widely deployed individual gunners in our line, their scouting was just as ineffective as our attempts were to shoot them down.

FOR more than a month the situation remained a deadlock, with the Hans locked up in their cities, while we mobilized gunners and supplies.

Had our stock of inerrtron been sufficiently great at this period, we could have ended the war quickly, with aircraft impervious to the "dis" ray. But the production of inerrtron is a painfully slow process, involving the building up of this weightless element from ultronic vibrations through the sub-electronic, electronic and atomic states into molecular form. Our laboratories had barely begun production on a quantity basis, for we had just learned how to protect them from Han air raids, and it would be many months more before the supply they had just started to manufacture would be finished. In the meantime we had enough for a few aircraft, for jumping belts and a small amount of armor.

We Wyomings possessed one swooper completely sheathed with inerrtron and counterweighted with ultron. The Altoonans and the Lycopings also had one apiece. But a shielded swooper, while impervious to the "dis" ray, was helpless against squadrons of Han aircraft, for the Hans developed a technique of playing their beams underneath the swooper in such fashion as to suck it down flutteringly into the vacuum so created, until they brought it finally, and more or less violently, to earth.

Ultimately the Hans broke our blockade to a certain extent, when they resumed traffic between their cities in great convoys, protected by squadrons of cruisers in vertical formation, playing a continuous cross-fire of disintegrator beams ahead of them and down on the sides in a most effective screen, so that it was very difficult for us to get a rocket through to the repeller rays.

But we lined the scar paths beneath their air routes for miles at a stretch with concealed gunners, some of whom would sooner or later register hits, and it was seldom that a convoy made the trip between Nu-Yok and Boss-Tan, Bah-Flo, Si-ka-ga or Ah-la-nah without losing several of its ships.

Hans who reached the ground alive were never taken prisoner. Not even the splendid discipline of the Americans could curb the wild hate developed through centuries of dastardly oppression, and the Hans were mercilessly slaughtered, when they did not save us the trouble by committing suicide.

Several times the Hans drove "air wedges" over our lines in this vertical or "cloud bank" formation, ploughing a scar path a mile or more wide through our positions. But at worst, to us, this did not mean the loss of more than a dozen men and girls, and generally their raids cost them one or more ships. They cut paths of destruction across the map, but they could not cover the entire area, and when they had ploughed out over our lines, there was nothing left for them to do but to turn around and plough back to Nu-Yok. Our lines closed up again after each raid, and we continued to take heavy toll from convoys and raiding fleets. Finally they abandoned these tactics.

So at the time of which I speak, the Spring of 2420 A.D., the Americans and the Hans were temporarily at pretty much of a deadlock. But the Hans were as desperate as we were sanguine, for we had time on our side.

It was at this period that we first learned of the Airlords' determination, a very unpopular one with their conscripted populations, to carry the fight to us on the ground. The time had passed when command of the air meant victory. We had no visible cities nor massed bodies of men for them to destroy, nothing but vast stretches of silent forests and hills, where our forces lurked, invisible from the air.

CHAPTER II

The "Ground Ships" Threaten

ONE of our Wyoming girls, on contact guard near Pocono, blundered into a hunting camp of the Bad Bloods, one of the renegade American

Gangs, which occupied the Blue Mountain section North of Delaware Water Gap. We had not invited their cooperation in this campaign, for they were under some suspicion of having trafficked with the Hans in past years, but they had offered no objection to our passage through their territory in our advance on Nu-Yok.

Fortunately our contact guard had been able to leap into the upper branches of a tree without being discovered by the Bad Bloods, for their discipline was lax and their guard careless. She overheard enough of the conversation of their Bosses around the camp fire beneath her to indicate the general nature of the Han plans.

After several hours she was able to leap away unobserved through the topmost branches of the trees, and after putting several miles between herself and their camp, she ultrophoned a full report to her Contact Boss back in the Wyoming Valley. My own Ultrophone Field Boss picked up the message and brought the graph record of it to me at once.

Her report was likewise picked up by the Bosses of the various Gang units in our line, and we had called a council to discuss our plans by word of mouth.

We were gathered in a sheltered glade on the Eastern slope of First Mountain on a balmy night in May. Far to the East, across the forested slopes of the lowlands, the flat stretches of open meadow and the rocky ridge that once had been Jersey City, the iridescent glow of Nu-Yok's protecting film of annihilation shot upward, gradually fading into a starry sky.

In the faint glow of our ulttronolamps, I made out the great figure and rugged features of Boss Casaman, commander of the Miffin unit, and the gray uniform of Boss Warn, who led the Sandsnipers of the Barnegat Beaches, and who had swooped over from his headquarters on Sandy Hook. By his side stood Boss Handan of the Winslows, a Gang from Central Jersee. In the group also were the leaders of the Altoonas, the Camerons, the Lycomings, Susquannas, Harshbargs, Hagersduns, Chesters, Reddings, Delawares, Elmirans, Kiugas, Hudsons and Connedigas.

Most of them were clad in forest-green uniforms that showed black at night, but each had some distinctive badge or item of uniform or equipment that distinguished his Gang.

Both the Miffin and Altoona bosses, for instance, wore heavy-looking boots with jointed knees. They came from sections that were not only mountainous, but rocky, where "leaping" involves many a slip and bruised limb, unless some protection of this sort is worn. But these boots were not as heavy as they looked, being counter-balanced somewhat with inerton.

The headgear of the Winslows was quite different from the close-fitting helmet of the Wyomings, being large and bushy looking, for in the Winslow territory there were many stretches of nearly bare land, with occasional scrubby pines, and a Winslow caught in the open, on the approach of a Han airship, would twist himself into a motionless imitation of a scrubby plant, that passed very successfully for the real thing, when viewed from several thousand feet in the air.

The Susquannas had a unit that was equipped with inerton shields, that were of the same shape as those

of the ancient Romans, but much larger, and capable of concealing their bearers from head to foot when they crouched slightly. These shields, of course, were colored forest green, and were irregularly shaded; they were balanced with inerton, so that their effective weight was only a few ounces. They were curious too, in that they had handles for both hands, and two small reservoir rocketguns built into them as integral parts.

In going into action, the Susquannas crouched slightly, holding the shields before them with both hands, looking through a narrow vision slit, and working both rocket guns. The shields, however, were a great handicap in leaping, and in advancing through heavy forest growth.

The field unit of the Delawares was also heavily armored. It was one of the most efficient bodies of shock troops in our entire line. They carried circular shields, about three feet in diameter, with a vision slit and a small rocket gun. These shields were held at arm's length in the left hand on going into action. In the right hand was carried an ax-gun, an affair not unlike the battle-ax of the Middle Ages. It was about three feet long. The shaft consisted of a rocket gun, with an ax-blade near the muzzle, and a spike at the other end. It was a terrible weapon. Jointed leg-guards protected the ax-gunner below the rim of his shield, and a hemispherical helmet, the front section of which was of transparent ulttron reaching down to the chin, completed his equipment.

The Susquannas also had a long-gun unit in the field.

One company of my Wyomings I had equipped with a weapon which I designed myself. It was a long-gun which I had adapted for bayonet tactics such as American troops used in the First World War, in the Twentieth Century. It was about the length of the ancient rifle, and was fitted with a short knife bayonet. The stock, however, was replaced by a narrow ax-blade and a spike. It had two hand-guards also. It was fired from the waist position.

In hand-to-hand work one lunged with the bayonet in a vicious, swinging up-thrust, following through with an up-thrust of the ax-blade as one rushed in on one's opponent, and then a down-thrust of the butt-spike, developing into a down-slice of the bayonet, and a final upward jerk of the bayonet at the throat and chin with a shortened grip on the barrel, which had been allowed to slide through the hands at the completion of the down-slice.

I ALMOST regretted that we would not find ourselves opposed to the Delaware ax-men in this campaign, so curious was I to compare the efficiency of the two bodies.

But both the Delawares and my own men were dated at the news that the Hans intended to fight it out on the ground at last, and the prospect that we might in consequence come to close quarters with them.

Many of the Gang Bosses were dubious about our Wyoming policy of providing our fighters with no inerton armor as protection against the disintegrator ray of the Hans. Some of them even questioned the value of all weapons intended for hand to hand fighting.

As Warn, of the Sandsnipers put it: "You should

be in a better position than anyone, Rogers, with your memories of the Twentieth Century, to appreciate that between the superdeadliness of the rocket gun and of the disintegrator ray there will never be any opportunity for hand-to-hand work. Long before the opposing forces could come to grips, one or the other will be wiped out."

But I only smiled, for I remembered how much of this same talk there was five centuries ago, and that it was even predicted in 1914 that no war could last more than six months.

That there would be hand to hand work before we were through, and in plenty, I was convinced, and so every able-bodied youth I could muster was enrolled in my infantry battalion and spent most of his time in vigorous bayonet practice. And for the same reason I had discarded the idea of armor. I felt it would be clumsy, and questioned its value. True, it was an absolute bar against the disintegrator ray, but of what use would that be if a Han ray found a crevice between overlapping plates, or if the ray was used to annihilate the very earth beneath the wearer's feet?

The only protective equipment that I thought was worth a whoop was a very peculiar device with which a contingent of five hundred Altoonas was supplied. They called it the "umbra-shield." It was a bell-shaped affair of inertron, counterweighted with ultron, about eight feet high. The gunner, who walked inside it, carried it easily with two shoulder straps. There were handles inside too, by which the gunner might more easily balance it when running, or lift it to clear any obstructions on the ground.

In the apex of the affair, above his head, was a small turret, containing an automatic rocket gun. The periscopic gun sight and the controls were on a level with the operator's eyes. In going into action he could, after taking up his position; simply stoop until the rim of the umbra-shield rested on the ground, or else slip off the shoulder straps, and stand there, quite safe from the disintegrator ray, and work his gun.

But again, I could not see what was to prevent the Hans from slicing underneath it, instead of directly at it, with their rays.

As I saw it, any American who was unfortunate enough to get in the direct path of a "dis" ray, was almost certain to "go out," unless he was locked up tight in a complete shell of inertron, as for instance, in an inertron swooper. It seemed to me better to concentrate all our efforts on tactics of attack, trusting to our ability to get the Hans before they got us.

I had one other main unit besides my bayonet battalion, a long-gun contingent composed entirely of girls, as were my scout units and most of my auxiliary contingents. These youngsters had been devoting themselves to target practice for months, and had developed a fine technique of range finding and the various other tactics of Twentieth Century massed artillery, to which was added the scientific perfection of the rocket guns and an average mental alertness that would have put the artilleryman of the First World War to shame.

From the information our contact guard had obtained, it appeared that the Hans had developed a type of "groundship" completely protected by a disintegrator

ray "canopy" that was operated from a short mast, and spread down around it as a cone.

These ships were merely adaptations of their airships, and were designed to travel but a few feet above the ground. Their repeller rays were relatively weak; just strong enough to lift them about ten or twelve feet from the surface. Hence they would draw but lightly upon the power broadcast from the city, and great numbers of them could be used. A special ray at the stern propelled them, and an extra-lift ray in the bow enabled them to nose up over ground obstacles. Their most formidable feature was the cone-shaped "canopy" of short range disintegrator ray designed to spread down around them from a circular generator at the tip of a twenty-foot mast amidship. This would annihilate any projectile shot at it, for they naturally could not reach the ship without passing through the cone of rays.

It was instantly obvious that the "ground ships" would prove to be the "tanks" of the twenty-fifth century, and with due allowance for the fact that they were protected with a sheathing of annihilating rays instead of with steel, that they would have about the same handicaps and advantages as tanks, except that since they would float lightly on short repeller rays, they could hardly resort to the destructive crushing tactics of the tanks of the First World War.

As soon as our first supplies of inertron-sheathed rockets came through, their invulnerability would be at an end, as indeed would be that of the Han cities themselves. But these projectiles were not yet out of the factories.

In the meantime, however, the groundships would be hard to handle. Each of them we understood would be equipped with a thin long-range "dis" ray, mounted in a turret at the base of the mast.

We had no information as to the probable tactics of the Hans in the use of these ships. One sure method of destroying them would be to bury mines in their path, too deep for the penetration of their protecting canopy, which would not, our engineers estimated, cut deeper than about three feet a second. But we couldn't ring Nu-Yok with a continuous mine on a radius of from five to fifteen or twenty miles. Nor could we be certain beforehand of the direction of their attack.

In the end, after several hours' discussion, we agreed on a flexible defense. Rather than risk many lives, we would withdraw before them, test their effectiveness and familiarize ourselves with the tactics they adopted. If possible, we would send engineers in behind them from the flanks, to lay mines in the probable path of their return, providing their first attack proved to be a raid rather than an advance to consolidate new positions.

CHAPTER III

We "Sink" the "Ground Ships"

BOSS HANDAN, of the Winslows, a giant of a man, a two-fisted fighter and a leader of great sagacity, had been selected by the council as our Boss Protm, and having given the scatter signal to the council, he retired to our general headquarters, which we had established on Second Mountain, a few miles in

the rear of the fighting front in a deep ravine.

There, in quarters cut far below the surface, he would observe every detail of the battle on the wonderful system of viewplates our ultrono engineers had constructed through a series of relays from ultrascopes observation posts and individual "*cammermen*."

Two hours before dawn our long distance *scopemen* reported a squadron of "ground ships" leaving the enemy's disintegrator wall, and heading rapidly somewhat to the south of us, toward the site of the ancient city of Newark. The ultrascopes could detect no canopy operation. This in itself was not significant, for they were penetrating hills in their lines of vision, most of them, which of course blurred their pictures to a slight extent. But by now we had a well-equipped electronoscope division, with instruments nearly equal to those of the Hans themselves; and these could detect no evidence of *dis* rays in operation.

Handan appreciated our opportunity instantly, for no sooner had the import of the message on the Bosses' channel become clear than we heard his personal command snapped out over the long-gunners' general channel.

Nine hundred and seventy long-gunners on the south and west sides of the city, concealed in the dark fastnesses of the forests and hillsides, leaped to their guns, switched on their dial lights, and flipped the little lever combinations on their pieces that automatically registered them on the predetermined position of map section HM-243-839, setting their magazines for twenty shots, and pressing their fire buttons.

For what seemed an interminable instant nothing happened.

Then several miles to the southeast, an entire section of the country literally blew up, in a fiery eruption that shot a mile into the air. The concussion, when it reached me, was terrific. The light was blinding.

And our *scopemen* reported the instant annihilation of the squadron.

What happened, of course, was this; the Hans knew nothing of our ability to see at night through our ultrascopes. Regarding itself as invisible in the darkness, and believing our instruments would pick up its location when its *dis* rays went into operation, the squadron made the fatal error of not turning on its canopies.

To say that consternation overwhelmed the Han high command would be putting it mildly. Despite their use of code and other protective expedients, we picked up enough of their messages to know that the incident badly demoralized them.

Their next attempt was made in daylight. I was aloft in my swooper at the time, hanging motionless about a mile up. Below, the groundships looked like a number of oval lozenges gliding across a map, each surrounded by a circular halo of luminescence that was its *dis* ray canopy.

They had nosed up over the spiny ridge of what once had been Jersey City, and were moving across the meadow lands. There were twenty of them.

Coming to the darker green that marked the forest on the "map" below me, they adopted a wedge formation, and playing their pencil rays ahead of them, they began to beam a path for themselves through the

forest. In my ears sounded the ultraphone instructions of my executives to the long-gunners in the forest, and one by one I heard the girls report their rapid retirement with their guns and other inerton-lightened equipment, I located several of them with my scopes, with which I could, of course, focus through the leafy screen above them, and noted with satisfaction the unhurried speed of their movements.

On ploughed the Han wedge, while my girls separated before it and retired to the sides. With a rapidity much greater than that of the ships themselves, the beams penetrated deeper and deeper into the forest, playing continuously in the same direction, literally melting their way through, as a stream of hot water might melt its way through a snow bank.

Then a curious thing happened. One of the ships near one wing of the wedge must have passed over unusually soft ground, or perhaps some irregularity in the control of its canopy generator caused it to dig deeper into the earth ahead of it, for it gave a sudden downward lurch, and on coming up out of it, swerved a bit to one side, its offense beam slicing full into the ship echeloned to the left ahead of it. That ship, all but a few plates on one side, instantly vanished from sight. But the squadron could not stop. As soon as a ship stood still, its canopy ray playing continuously in one spot, the ground around it was annihilated to a continuously increasing depth. A couple of them tried it, but within a space of seconds, they had dug such deep holes around themselves that they had difficulty in climbing out. Their commanders, however, had the foresight to switch off their offense rays, and so damaged no more of their comrades.

I switched in with my ultraphone on Boss Handan's channel, intending to report my observation, but found that one of our swooper scouts, who, like myself, was hanging above the Hans, was ahead of me. Moreover, he was reporting a suddenly developed idea that resulted in the untimely end of the Hans' groundship threat.

"Those ships can't climb out of deep holes, Boss," he was saying excitedly. "Lay a big barrage against them—no, not on them—in front of them—always in front of them. Pull it back as they come on. But churn h—! out of the ground in front of them! Get the rocketmen to make a penetrative time rocket. Shoot it into the ground in front of them, deep enough to be below their canopy ray, see, and detonate under them as they go over it!"

I heard Handan's roar of exultation as I switched off again to order a barrage from my Wyoming girls. Then I threw my rocket motor to full speed and shot off a mile to one side, and higher, for I knew that soon there would be a boiling eruption below.

No smoke interfered with my view of it, for our atomic explosive was smokeless in its action. A line of blinding, flashing fire appeared in front of the groundship wedge. The ships ploughed with calm determination toward it, but it withdrew before them, not steadily, but jerkily intermittent, so that the ground became a series of gigantic humps, ridges and shell holes. Into these the Han ships wallowed, plunging ponderously, yet not daring to stop while their protective canopy

rays played, not daring to shut off these active rays.

One overturned. Our observers reported it. The result was a hail of rocket shells directly on the squadron. These could not penetrate the canopies of the other ships, but the one which had turned turtle was blown to fragments.

The squadron attempted to change its course and dodge the barrier in front of it. But a new barrier of blazing detonations and churned earth appeared on its flanks. In a matter of minutes it was ringed around, thanks to the skill of our fire control.

One by one the wallowing ships plunged into holes from which they could not extricate themselves. One by one their canopy rays were shut off, or the ships somersaulted off the knolls on which they perched, as their canopies melted the ground away from around them. So one by one they were destroyed.

Thus the second ground sortie of the Hans was annihilated.

CHAPTER IV

Han Electrono-Ray Science

AT this period the Hans of Nu-Yok had only one airship equipped with their new armored repeller ray, their latest defense against our tactics of shooting rockets into the repeller rays and letting the latter hurl them up against the ships. They had developed a new steel alloy of tremendous strength, which passed their *rep* ray with ease, but was virtually impervious to our most powerful explosives. Their supplies of this alloy were limited, for it could be produced only in the Lo-Tan shops, for it was only there that they could develop the degree of electronic power necessary for its manufacture.

This ship shot out toward our lines just as the last of the groundships turned turtle and was blown to pieces. As it approached, the rockets of our invisible and widely scattered gunners in the forest below began to explode beneath its *rep* ray plates. The explosions caused the great ship to plunge and roll mightily, but otherwise did it no serious harm that I could see, for it was very heavily armored.

Occasionally rockets fired directly at the ship would find their mark and tear gashes in its side and bottom plates, but these hits were few. The ship was high in the air, and a far more difficult target than were its *rep* ray columns. To hit the latter, our gunners had only to gauge their aim vertically. Range could be practically ignored, since the *rep* ray at any point above two-thirds the distance from the earth to the ship, would automatically hurl the rocket upward against the *rep* ray plate.

As the ship sped toward us, rocking, plunging and recovering, it began to beam the forest below. It was equipped with a superbeam too, which cut a swathe nearly a hundred feet wide wherever it played.

With visions of many a life snuffed out below me, I surrendered to the impulse to stage a single-handed attack on this ship, feeling quite secure in my floating shell of inertron. I nosed up vertically, and rocketed for a position above the ship. Then as I climbed upward, as yet unobserved in my tiny craft that was scarcely larger than myself, I trained my telultroscope on the

Han ship, focussing through to a view of its interior.

Much as I had imbibed of this generation's hatred for the Hans, I was forced to admire them for the completeness and efficiency of this marvelous craft of theirs.

Constantly twirling the controls of my scope to hold the focus, I examined its interior from nose to stern.

IT may be of interest at this point to give the reader a layman's explanation of the electronic or ionic machinery of these ships, and of their general construction, for today the general public knows little of the particular application of the electronic laws which the Hans used, although the practical application of ultrasonics are well understood.

Back in the Twentieth Century I had, like literally millions of others, dabbled a bit in "radio" as we called it then; the science of the Hans was simply the superdevelopment of "electricity," "radio," and "broadcasting."

It must be understood that this explanation of mine is not technically accurate, but only what might be termed an illustrative approximation.

The Hans power-stations used to broadcast three distinct "powers" simultaneously. Our engineers called them the "starter," the "pulsee" and the "sub-disintegrator." The last named had nothing to do with the operation of the ships, but was exclusively the powerizer of the disintegrator generators.

The "starter" was not unlike the "radio" broadcasts of the Twentieth Century. It went out at a frequency of about 1,000 kilocycles, had an amperage of approximately zero, but a voltage of two billion. Properly amplified by the use of *inducto-static* batteries (a development of the principle underlying the earth induction compass applied to the control of static) this current energized the "A" *ionomagnetic* coils on the airships, large and sturdy affairs, which operated the *Attractoreflex Receivers*, which in turn "pulled in" the second broadcast power known as the "pulsee," absorbing it from every direction, literally exhausting it from surrounding space. The "pulsee" came in at about a half-billion volts, but in very heavy amperage, proportional to the capacity of the receiver, and on a long wave—at audio frequency in fact. About half of this power reception ultimately actuated the *repeller ray* generators. The other half was used to energize the "B" *ionomagnetic* coils, peculiarly wound affairs, whose magnetic fields constituted the only means of insulating and controlling the circuits of the three "powers."

The repeller ray generators, operating on this current, and in conjunction with "twin synchronizers" in the power broadcast plant, developed two rhythmically variable ether-ground circuits of opposite polarity. In the "X" circuit, the negative was grounded along an ultraviolet beam from the ship's repeller-ray generator. The positive connection was through the ether to the "X synchronizer" in the power plant, whose opposite pole was grounded. The "Y" circuit travelled the same course, but in the opposite direction.

The rhythmic variables of these two opposing circuits, as nearly as I can understand it, in heterodyning, created a powerful material "push" from the earth, up

along the violet ray beam against the *rep* ray generator and against the two synchronizers at the power plant.

This push developed molecularly from the earth-mass-resultant to the generator; and at the same fractional distance from the *rep* ray generator to the power plant.

The force exerted upward against the ship was, of course, highly concentrated, being confined to the path of the ultraviolet beam. Air or any material substance, coming within the indicated section of the beam, was thrown violently upward. The ships actually rode on columns of air thus forcefully upthrown. Their "home berths" and "stations" were constructed with air pits beneath. When they rose from ordinary ground in open country, there was a vast upheaval of earth beneath their generators at the instant of take-off, but this, of course, ceased as they got well above ground level.

Equal pressure to the lifting power of the generator was exerted against the synchronizers at the power plant, but this force, not being concentrated directionally along an ultraviolet beam, involved a practical problem only at points relatively close to the synchronizers.

Of course the synchronizers were automatically controlled by the operation of the generators, and only the two were needed for any number of ships drawing power from the station, providing their protection was rugged enough to stand the strain.

Actually, they were isolated in vast spherical steel chambers with thick walls, so that nothing but air pressure would be hurled against them, and this, of course, would be self-neutralizing, coming as it did from all directions.

The "sub-disintegrator power" reached the ships as an ordinary broadcast reception at a negligible amperage, but from one to 500 "quints" (quintillions) voltage, controllable only by the fields of the "*B*" *ionomagnetic* coils. It had a wave-length of about ten meters. In the *dis* ray generator, this wave-length was broken up into an almost unbelievably high frequency, and became a directionally controlled wave of an infinitesimal fraction of an inch. This wave-length, actually identical with the diameter of an electron, that is to say, being accurately "tuned" to an electron, disrupted the orbital paths and balanced pulsations of the electrons within the atom, so desynchronizing them as to destroy polarity balance of the atom and causing it to cease to exist as an atom. It was in this way that the ray reduced matter to "nothingness."

This destruction of the atom, and a limited power for its reconstruction under certain conditions, marked the utmost progress of the Han science.

CHAPTER V

American Ultronic Science

OUR own engineers, working in shielded laboratories far underground, had established such control over the "de-atomized" electrons as to dissect them in their turn into *sub-electrons*. Moreover, they had carried through the study of this "order" to the point where they finally "dissected" the *sub-electron* into its component *ultrons*, for the funda-

mental laws underlying these successive orders are not radically dissimilar. And as they progressed, they developed constructive as well as destructive practice. Hence the great triumphs of *ultron* and *inerttron*, our two wonderful synthetic elements, built up from super-balanced and sub-balanced ultronic whorls, through the *sub-electronic* order into the *atomic* and *molecular*.

Hence also, come our relatively simple and beautifully efficient *ultraphones* and *ultrascopes*, which in their phonic and visual operation penetrate obstacles of material, electronic and sub-electronic nature without let or hindrance, and with the consumption of but infinitesimal power.

Static disturbance, I should explain, is negligible in the sub-electronic order, and non-existent in the *ultron*.

The pioneer expeditions of our engineers into the *ultronic* order, I am told, necessitated the use of most elaborate, complicated and delicate apparatus, as well as the expenditure of most costly power, but once established there, all necessary power is developed very simply from tiny batteries composed of thin plates of *metultron* and *katultron*. These two substances, developed synthetically in much the same manner as ordinary *ultron*, exhibit dual phenomena which for sake of illustration I may compare with certain of the phenomena of radioactivity. As radium is constantly giving off electronic emanations and changing its atomic structure thereby, so *katultron* is constantly giving off *ultronic* emanations, and so changing its *sub-electronic* form, while *metultron*, its complement, is constantly attracting and absorbing *ultronic* values, and so changing its sub-electronic nature in the opposite direction. Thin plates of these two substances, when placed properly in juxtaposition, with insulating plates of *inerttron* between, constitute a battery which generates an ultronic current.

And it is a curious parallel that just as there were many mysteries connected with the nature of electricity in the Twentieth Century (mysteries which, I might mention, never *have* been solved, notwithstanding our penetration into the "sub-" orders) so there are certain mysteries about the ultronic current. It will flow, for instance, through an *ultron* wire, from the *katultron* to the *metultron* plate, as electricity will flow through a copper wire. It will short circuit between the two plates if the *inerttron* insulation is imperfect. When the insulation is perfect, however, and no *ultron* metallic circuit is complete, the "current" (apparently the same that would flow through the metallic circuit) is projected into space in an absolutely straight line from the *katultron* plate, and received from space by the *metultron* plate on the same line. This line is the theoretical straight line passing through the mass-center of each plate. The shapes and angles of the plates have nothing to do with it, except that the perpendicular distance of the plate edges from the mass-center line determines the thickness of the beam of parallel current-rays.

Thus a simple battery may be used either as a sender or receiver of current. Two batteries adjusted to the same center line become connected in series just as if they were connected by *ultron* wires.

In actual practice, however, two types of batteries are

used; both the *foco* batteries and *broadcast* batteries.

Foco batteries are twin batteries, arranged to shoot a positive and a negative beam in the same direction. When these beams are made intermittent at light frequencies (though they are not light waves, nor of the same order as light waves) and are brought together, or focussed, at a given spot, the space in which they cross radiates alternating ultronic current in every direction. This radiated *ultralight* acts like true light so long as the crossing beams vibrate at light frequencies, except in three respects; first, it is not visible to the eye; second, its "color" is exclusively dependent on the frequency of the *foco* beams, which determine the frequency of the alternating radiation. Material surfaces, it would appear, reflect them all in equal value, and the color of the resultant picture depends on the color of the *foco* frequencies. By altering these, a reddish, yellowish or bluish picture may be seen. In actual practice an orthochromatic mixture of frequencies is used to give a black, gray and white picture. The third difference is this; rays pulsating in line toward any ultron object connected with the rear plates of the twin batteries through rectifiers cannot be reflected by material objects, for it appears they are subject to a kind of "pull" which draws them straight through material objects, which in a sense are "magnetized" and while in this state offer no resistance.

Ultrons, when so connected with battery terminals, glows with true light under the impact of *ultralight*, and if in the form of a lens or set of lenses, may be made to deliver a picture in any telescopic degree desired.

THE essential parts of an ultroscope, then, are twin batteries with focal control and frequency control; an ultron shield, battery connected and adjustable, to intercept the direct rays from the "*glow-spot*," with an ordinary light-shield between it and the lens; and the lens itself, battery connected and with more or less telescopic elaboration.

To look through a substance at an object, one has only to focus the *glow-spot* beyond the substance but on the near side of the object and slightly above it.

A complete apparatus may be "set" for "penetrative," "distance" and "normal vision."

In the first, which one would use to look through the forest screen from the air, or in examining the interior of a Han ship or any opaque structure, the *glow-spot* is brought low, at only a tiny angle above the vision line, and the shield, of course, must be very carefully adjusted.

"Distance" setting would be used, for instance, in surveying a valley beyond a hill or mountain; the *glow-spot* is thrown high to illuminate the entire scene.

In the "normal" setting the *foco* rays are brought together close overhead, and illuminate the scene just as a lamp of super brilliancy would in the same position.

For phonic communication a spherical sending battery is a ball of metultron, surrounded by an insulating shell of inertron, and this in turn by a spherical shell of katultron, from which the current radiates in every direction, tuning being accomplished by frequency of intermissions, with audiofrequency modulation. The re-

ceiving battery has a core pole of katultron and an outer shell of metultron. The receiving battery, of course, picks up all frequencies, the undesired ones being tuned out in detection.

Tuning, however, is only a convenience for privacy and elimination of interference in ultraphonic communication. It is not involved as a necessity, for untuned currents may be broadcast at voice controlled frequencies, directly and without any carrier wave.

To use plate batteries or single center-line batteries for phonic communication would require absolutely accurate directional aligning of sender and receiver, a very great practical difficulty, except when sender and receiver are relatively close and mutually visible.

This, however, is the regular system used in the Inter-Gang network for official communication. The senders and receivers used in this system are set only with the greatest difficulty, and by the aid of the finest laboratory apparatus, but once set, they are permanently locked in position at the stations, and barring earthquakes or insecure foundations, need no subsequent adjustment. Accuracy of alignment permits beam paths no thicker than the old lead pencils I used to use in the Twentieth Century.

The non-interference of such communication lines, and the difficulty of cutting in on them from any point except immediately adjacent to the sender or receiver, is strikingly apparent when it is realized that every square inch of an imaginary plane bisecting the unlocated beam would have to be explored with a receiving battery in order to locate the beam itself.

A practical compromise between the spherical or universal broadcast senders and receivers on the one hand, and the single line batteries on the other, is the *multi-facet battery*. Another, and more practical device particularly for distance work, is the *window-spherical*. It is merely an ordinary spherical battery with a shielding shell with an opening of any desired size, from which a directionally controlled beam may be emitted in different forms, usually that simply of an expanding cone, with an angle of expansion sufficient to cover the desired territory at the desired point of reception.

CHAPTER VI An Unequal Duel

BUT to return to my narrative, and my *swooper*, from which I was gazing at the interior of the Han ship.

This ship was not unlike the great dirigibles of the Twentieth Century in shape, except that it had no suspended control car nor gondolas, no propellers, and no rudders, aside from a permanently fixed double-fishtail stabilizer at the rear, and a number of "keels" so arranged as to make the most of the repeller ray air-lift columns.

Its width was probably twice as great as its depth, and its length about twice its width. That is to say, it was about 100 feet from the main keel to the top-deck at their maximum distance from each other, about 200 feet wide amidship, and between 400 and 500 feet long. It had in addition to the top-deck, three interior decks. In its general curvature the ship was a compro-

mise between a true streamline design and a flattened cylinder.

For a distance of probably 75 to 100 feet back of the nose there were no decks except that formed by the bottom of the hull. But from this point back the decks ran to within a few feet of the stern.

At various spots on the hull curvature in this great "hollow nose" were platforms from which the crews of the *dis ray* generators and the *electronoscope* and *electrophone* devices manipulated their apparatus.

Into this space from the forward end of the center deck, projected the control room. The walls, ceiling and floor of this compartment were simply the surfaces of *viewplates*. There were no windows or other openings.

The operation officers within the control room, so far as their vision was concerned, might have imagined themselves suspended in space, except for the transmitters, levers and other signalling devices around them.

Five officers, I understand, had their posts in the control room; the captain, and the chiefs of *scopes*, *phones*, *dis rays* and *navigation*. Each of these was in continuous interphone communication with his subordinates in other posts throughout the ship. Each *viewplate* had its phone connecting with its "*eye machines*" on the hull, the crews of which would switch from telescopic to normal view at command.

There were, of course, many other *viewplates* at executive posts throughout the ship.

The Hans followed a peculiar system in the command of their ships. Each ship had a double complement of officers. Active Officers and Base Officers. The former were in actual, active charge of the ship and its apparatus. The latter remained at the ship base, at desks equipped with *viewplates* and phones, in constant communication with their "correspondents," on the ship. They acted continuously as consultants, observers, recorders and advisors during the flight or action. Although not primarily accountable for the operation of the ship, they were senior to, and in a sense responsible for the training and efficiency of the Active Officers.

The *ionomagnetic coils*, which served as the casings, "plates" and insulators of the gigantic condensers, were all located amidship on a center line, reaching clear through from the top to the bottom of the hull, and reaching from the forward to the rear rep-ray generators; that is, from points about 110 feet from bow and stern. The crew's quarters were arranged on both sides of the coils. To the outside of these, where the several decks touched the hull, were located the various pieces of phone, *scope* and *dis ray* apparatus.

The ship into which I was gazing with my *ultrascopes* (at a telescopic and penetrative setting), carry a crew of perhaps 150 men all told. And except for the strained looks on their evil yellow faces I might have been tempted to believe I was looking on some Twenty-fifth Century pleasure excursion, for there was no running around nor appearance of activity.

The Hans loved their ease, and despite the fact that this was a war ship, every machine and apparatus in it was equipped with a complement of seats and specially designed couches, in which officers and men reclined as

they gazed at their viewplates, and manipulated the little sets of controls placed convenient to their hands.

THE picture was a comic one to me, and I laughed, wondering how such soft creatures had held the sturdy and virile American race in complete subjection for centuries. But my laugh died as my mind grasped at the obvious explanation. These Hans were only soft physically. Mentally they were hard and hellishly efficient; ruthless, relentless and conscienceless.

Impulsively I nosed my *swooper* down toward the ship and shot toward it at full rocket power. I had acted so swiftly that I had covered nearly half the distance toward the ship before my mind slowly drifted out of the haze of my emotion. This proved my undoing. Their scopeman saw me too quickly, for in heading directly at them I became easily visible, appearing as a steady, expanding point. Looking through their hull, I saw the crew of a *dis ray* generator come suddenly to attention. A second later their beam engulfed me.

For an instant my heart stood still. But the inertron shell of my swooper was impervious to the disintegrator ray. I was out of luck, however, so far as my control over my tiny ship was concerned. I had been hurtling in a direct line toward the ship when the beam found me. Now, when I tried to swerve out of the beam, the swooper responded but sluggishly to the shift I made in the rocket angle. I was, of course, traveling straight down a beam of vacuum. As my craft slowly nosed to the edge of the beam, the air rushing into this vacuum from all sides threw it back in again.

Had I shot my ship across one of these beams at right angles, my momentum would have carried me through with no difficulty. But I had no momentum now except in the line of the beam, and this being a vacuum now, my momentum, under full rocket power, was vastly increased. This realization gave me a second and more acute thrill. Would I be able to check my little craft in time, or would I, helpless as a bullet itself, crash through the shell of the Han ship to my own destruction?

I shut off my rocketmotor, but noticed no practical diminution of speed.

It was the fear of the Hans themselves that saved me. Through my *ultrascopes* I saw sudden alarm on their faces, hesitation, a frantic officer in the control room jabbering into his phone. Then shakily the crew flipped their beam off to the side. The jar on my craft was terrific. Its nose caught the rushing tumble of air first, of course, and my tail sailing in a vacuum, swung around with a sickening wrench. My swooper might as well have been a barrel in the tumult of waters at the foot of Niagara. What was worse, the Hans kept me in that condition. Three of their beams were now playing in my direction, but not directly on me except for split seconds. Their technique was to play their beams around me more than on me, jerking them this way and that, so as to form vacuum pockets into which the air slapped and roared as the beams shifted, tossing me around like a chip.

Desperately I tried to bring my craft under control, to point its nose toward the Han ship and discharge an explosive rocket. Bitterly I cursed my self-confidence,

and my impulsive action. An experienced pilot of the present age would have known better than to be caught shooting straight down a *dis* ray beam. He would have kept his ship shooting constantly at some angle to it, so that his momentum would carry him across it if he hit it. Too late I realized that there was more to the business of air fighting, than instinctive skill in guiding a swooper.

At last, when for a fraction of a second my nose pointed toward the Hans, I pressed the button of my rocket gun. I registered a hit, but not an accurate one. My projectile grazed an upper section of the ship's hull. At that it did terrific damage. The explosion battered in a section about fifty feet in diameter, partially destroying the top deck.

At the same instant I had shot my rocket, I had, in a desperate attempt to escape that turmoil of tumbling air, released a catch and dropped all that it was possible to drop of my ultron ballast. My swooper shot upward, like a bubble streaking for the surface of water.

I was free of the trap in which I had been caught, but unable to take advantage of the confusion which reigned on the Han ship.

I was as helpless to maneuver my ship now, in its up-rush, as when I had been tumbling in the air pockets. Moreover I was badly battered from plunging around in my shell like a pellet in a box, and partially unconscious.

I was miles in the air when I recovered myself. The swooper was steady enough now, but still rising, my instruments told me, and traveling in a general westward direction at full speed. Far below me was a sea of clouds, stretching from horizon to horizon, and through occasional breaks in its surface I could see still other seas of clouds at lower levels.

CHAPTER VII

Captured!

CERTAINLY my situation was no less desperate. Unless I could find some method of compensating for my lost ballast, the inverse gravity of my inertron ship would hurl me continuously upward until I shot forth from the last air layer into space. I thought of jumping, and floating down on my inertron belt, but I was already too high for this. The air was too rarefied to permit breathing outside, though my little air compressors were automatically maintaining the proper density within the shell. If I could compress a sufficiently large quantity of air inside the craft, I would add to its weight. But there seemed little chance that I would myself be able to withstand sufficient compression.

I thought of releasing my inertron belt, but doubted whether this would be enough. Besides I might need the belt badly if I did find some method of bringing the little ship down, and it came too fast.

At last a plan came into my half-numbed brain that had some promise of success, though it was desperate enough. Cutting one of the hose pipes on my air compressor, and grasping it between my lips, I set to work to saw off the heads of the rivets that held the entire nose section of the swooper (inertron plates had to be

grooved and riveted together, since the substance was impervious to heat and could not be welded). Desperately I sawed, hammered and chiseled, until at last with a wrench and a snap, the plate broke away.

The released nose of the ship shot upward. The rest began to drop with me. How fast I dropped I do not know, for my instruments went with the nose. Half fainting, I grimly clenched the rubber hose between my teeth, while the little compressor "carried on" nobly, despite the wrecked condition of the ship, giving me just enough air to keep my lungs from collapsing.

At last I shot through a cloud layer, and a long time afterward, it seemed, another. From the way in which they flashed up to meet me and to appear away above me, I must have been dropping like a stone.

At last I tried the rocket motor, very gently, to check my fall. The swooper was, of course, dropping tail first, and I had to be careful lest it turn over with a sharp blast from the motor, and dump me out.

Passing through the third layer of clouds I saw the earth beneath me. Then I jumped, pulling myself up through the jagged opening, and leaping upward while the remains of my ship shot away below me.

On approaching the ground I opened my chute-cape, to further check my fall, and landed lightly, with no further mishap. Whereupon I promptly threw myself down and slept, so exhausted was I with my experience.

It was not until the next morning that I awoke and gazed about me. I had come down in mountainous country. My intention was to get my bearing by tuning in headquarters with my ultraphone. But to my dismay I found the little battery disks had been torn from the earflaps of my helmet, though my chest-disk transmitter was still in place, and so far as I could see, in working order. I could report my experience, but could receive no reply.

I spent a half hour repeating my story and explanation on the headquarters channel, then once more surveyed my surroundings, trying to determine in which direction I had better leap. Then there came a stab of pain on the top of my head, and I dropped unconscious.

I regained consciousness to find myself, much to my surprise, a prisoner in the hands of a foot detachment of some thirty Hans. My surprise was a double one; first that they had not killed me instantly; second, that a detachment of them should be roaming this wild country afoot, obviously far from any of their cities, and with no ship hanging in the sky above them.

AS I sat up, their officer grunted with satisfaction and growled a guttural command. I was seized and pulled roughly to my feet by four soldiers, and hustled along with the party into a wooded ravine, through which we climbed sharply upward. I surmised, correctly as it turned out, that some projectile had grazed my head, and I was in such shape that if it had not been for the fact that my inertron belt bore most of my weight, they would have had to carry me. But as it was I made out well, and at the end of an hour's climb was beginning to feel like myself again, though the Han soldiers around me were puffing and drooping

as men will, no matter how healthy, when they are totally unaccustomed to physical effort.

At length the party halted for a rest. I observed them curiously. Except for a few brief exciting moments at the time of our air raid on the intelligence office in Nu-Yok, I had seen no living specimens of this yellow race at close quarters.

They looked little like the Mongolians of the Twentieth Century, except for their slant eyes and round heads. The characteristic of the high cheek bones appeared to have been bred out of them, as were those of the relatively short legs and the muddy yellow skin. To call them yellow was more figurative than literal. Their skins were whiter than those of our own weather-tanned forest men. Nevertheless, their pigmentation was peculiar, and what there was of it looked more like a pale orange tint than the ruddiness of the Caucasian. They were well formed, but rather undersized and soft looking, small muscled and smooth-skinned, like young girls. Their features were finely chiseled, eyes beady, and nose slightly aquiline.

They were uniformed, not in close-fitting green or other shades of protective coloring, such as the unobtrusive gray of the Jersey Beaches or the deadened russet of the autumn uniforms of our people. Instead they wore loose fitting jackets of some silky material, and loose knee pants. This particular command had been equipped with form moulded boots of some soft material that reached above the knee under their pants. They wore circular hats with small crowns and wide rims. Their loose jackets were belted at the waist, and they carried for weapons each man a knife, a short double-edged sword and what I took to be a form of magazine rocket gun. It was a rather bulky affair, short barreled, and with a pistol grip. It was obviously intended to be fired either from the waist position or from some sort of support, like the old machine guns. It looked, in fact, like a rather small edition of the Twentieth Century arm.

And have I mentioned the color of their uniforms? Their circular hats and pants were a bright yellow; their coats a flaming scarlet. What targets they were!

I must have chuckled audibly at the thought, for their commander who was seated on a folding stool one of his men had placed for him, glanced in my direction, and, at his arrogant gesture of command. I was prodded to my feet, and with my hands still bound, as they had been from the moment I recovered consciousness, I was dragged before him.

Then I knew what it was about these Hans that kept me in a turmoil of irritation. It was their sardonic, mocking, cruel smiles; smiles which left their stamp on their faces, even in repose. Now the commander was smiling tauntingly at me. When he spoke, it was in my own language.

"So!" he sneered, "You beasts have learned to laugh. You have gotten out of control in the last year or so. But that shall be remedied. In the meantime, a simple little surgical operation would make your smile a permanent one, reaching from ear to ear. But there, my orders are to deliver you and your equipment, all we have of it, intact. The Heaven Born has had a whim."

"And who," I asked, "is this Heaven Born?"

"San-Lan," he replied, "misbegotten spawn of the late High Priestess Nlui-Mok, and now Most Glorious Air Lord of All the Hans." He rolled out these titles with a bow of exaggerated respect toward the West, and in a tone of mockery. Those of his men who were near enough to hear, snickered and giggled.

I was to learn that this amazing attitude of his was typical rather than exceptional. Strange as it may seem, no Han rendered any respect to another, nor expected it in return; that is, not genuine respect. Their discipline was rigid and cold-bloodedly heartless. The most elaborate courtesies were demanded and accorded among equals and from inferiors to superiors, but such was the intelligence and moral degradation of this remarkable race, that every one of them recognized these courtesies for what they were; they must of necessity have been hollow mockeries. They took pleasure in forcing one another to go through with them, each trying to outdo the other in cynical, sardonic thrusts, clothed in the most meticulously ceremonious courtesy. As a matter of fact, my captor, by this crude reference to the origin of his ruler, was merely proving himself a crude fellow, guilty of a vulgarity rather than of a treasonable or disrespectful remark. An officer of higher rank and better breeding, would have managed a clever innuendo, less direct, but equally plain.

I was about to ask him what part of the country we were in and where I was to be taken, when one of his men came running to him with a little portable electrophone, which he placed before him, with much bowing and scraping.

He conversed through this for a while, and then condescended to give me the information that a ship would soon be above us, and that I was to be transferred to it. In telling me this, he managed to convey, with crude attempts at mock-courtesy, that he and his men would feel relieved to be rid of me as a menace to health and sanitation, and would take exquisite joy in inflicting me upon the crew of the ship.

CHAPTER VIII

Hypnotic Torture

SOME twenty minutes later the ship arrived. It settled down slowly into the ravine on its repeller rays until it was but a few feet above the tree tops. There it was stopped, and floated steadily, while a little cage was let down on a wire. Into this I was hustled and locked, whereupon the cage rose swiftly again to a hole in the bottom of the hull, into which it fitted snugly, and I stepped into the interior of a craft not unlike the one with which I had had my fateful encounter, the cage being unlocked.

The cabin in which I was confined was not an outside compartment, but was equipped with a number of viewplates.

The ship rose to a great height, and headed westward at such speed that the hum of the air past its smooth plates rose to a shrill, almost inaudible moan. After a lapse of some hours we came in sight of an impressive mountain range, which I correctly guessed to be the Rockies. Swerving slightly, we headed down toward one of the topmost pinnacles of the range, and

there unfolded in one of the viewplates in my cabin a glorious view of Lo-Tan, the Magnificent, a fairy city of glistening glass spires and iridescent colors, piled up on sheer walls of brilliant blue, on the very tip of this peak.

Nor was there any sheen of shimmering disintegrator rays surrounding it, to interfere with the sparkling sight. So far-flung were the defenses of Lo Tan, I found, that it was considered impossible for an American rocket gunner to get within effective range, and so numerous were the *dis* ray batteries on the mountain peaks and in the ravines, in this encircling line of defenses, drawn on a radius of no less than 100 miles, that even the largest of our inertron sheathed aircraft, in the opinion of the Hans, could easily be brought to earth through air-pocketing tactics. And this, I was the more ready to believe after my own recent experience.

I spent two months as a prisoner in Lo-Tan. I can honestly say that during that entire time every attention was paid to my physical comfort. Luxuries were showered upon me. But I was almost continuously subjected to some form of mental torture or moral assault. Most elaborately staged attempts at seduction were made upon me with drugs, with women. Hypnotism was resorted to. Viewplates were faked to picture to me the complete rout of American forces all over the continent. With incredible patience, and laboring under great handicaps, in view of the vigor of the American offensive, the Han intelligence department dug up the fact that somewhere in the forces surrounding Nu-Yok, I had left behind me Wilma, my bride of less than a year. In some manner, I will never tell how, they discovered some likeness of her, and faked an electronoscopic picture of her in the hands of torturers in Nu-Yok, in which she was shown holding out her arms piteously toward me, as though begging me to save her by surrender.

Surrender of what? Strangely enough, they never indicated that to me directly, and to this day I do not know precisely what they expected or hoped to get out of me. I surmise that it was information regarding the American sciences.

There was, however, something about the picture of Wilma in the hands of the torturers that did not seem real to me, and my mind still resisted. I remember gazing with staring eyes at that picture, the sweat pouring down my face, searching eagerly for some visible evidence of fraud and being unable to find it. It was the identical likeness of Wilma. Perhaps had my love for her been less great, I would have succumbed. But all the while I knew subconsciously that this was not Wilma. Product of the utmost of nobility in this modern virile, rugged American race, she would have died under even worse torture than these vicious Han scientists knew how to inflict, before she would have pleaded with me this way to betray my race and her honor.

But these were things that not even the most skilled of the Han hypnotists and psychoanalysts could drag from me. Their intelligence division also failed to pick up the fact that I was myself the product of the Twen-

tieth Century, and not the Twenty-fifth. Had they done so, it might have made a difference. I have no doubt that some of their most subtle mental assaults missed fire because of my own Twentieth Century "dense-ness." Their hypnotists inflicted many horrifying nightmares on me, and made me do and say many things that I would not have done in my right senses. But even in the Twentieth Century we had learned that hypnotism cannot make a person violate his fundamental concepts of morality against his will, and steadfastly I steeled my will against them.

I have since thought that I was greatly aided by my newness to this age. I have never, as a matter of fact, become entirely attuned to it. And even today I confess to a longing wish that man might travel backward as well as forward in time. Now that my Wilma has been at rest these many years, I wish that I might go back to the year 1927, and take up my old life where I left it off, in the abandoned mine near Scranton.

And at the period of which I speak, I was less attuned than now to the modern world. Real as my life was, and my love for my wife, there was much about it all that was like a dream, and in the midst of my tortures by the Hans, this complex—this habit of many months—helped me to tell myself that this, too, was all a dream, that I must not succumb, for I would wake up in a moment.

And so they failed.

MORE than that, I think I won something nearer to genuine respect from those around me than any other Hans of that generation accorded to anybody.

Among these was San-Lan himself, the ruler. In the end it was he who ordered the cessation of these tortures, and quite frankly admitted to me his conviction that they had been futile and that I was in many senses a super-man. Instead of having me executed, he continued to shower luxuries and attentions on me, and frequently commanded my attendance upon him.

Another was his favorite concubine, Ngo-Lan, a creature of the most alluring beauty; young, graceful and most delicately seductive, whose skill in the arts and sciences put many of their doctors to shame. This creature, his most prized possession, San-Lan with the utmost moral callousness ordered to seduce me, urging her to apply without stint and to its fullest extent, her knowledge of evil arts. Had I not seen the naked horror of her soul, that she let creep into her eyes for just one unguarded instant, and had it not been for my conviction of Wilma's faith in me, I do not know what—but suffice it to say that I resisted this assault also.

Had San-Lan only known it, he might have had a better chance of breaking down my resistance through another bit of femininity in his household, the little nine-year-old Princess Lu-Yan, his daughter.

I think San-Lan held something of real affection for this sprightly little mite, who in spite of the sickening knowledge of rottenness she had already acquired at this early age, was the nearest thing to innocence I found in Lo-Tan. But he did not realize this, and could not; for even the most natural and fundamental affection of the human race, that of parents for their offspring, had

been so degraded and suppressed in this vicious Han civilization as to be unrecognizable. Naturally San-Lan could not understand the nature of my pity for this poor child, nor the fact that it might have proved a weak spot in my armor. But had he done so, I truly believe he would have been ready to inflict degradation, torture and even death upon her, to make me surrender the information he wanted.

Yet this man, perverted product of a morally degraded race, had about him something of true dignity; something of sincerity, in a warped, twisted way. There were times when he seemed to sense vaguely, gropingly, wonderingly, that he might have a soul.

The Han philosophy for centuries had not admitted the existence of souls. Its conception embraced nothing but electrons, protons and molecules, and still was struggling desperately for some shred of evidence that thoughts, will power and consciousness of self were nothing but chemical reactions. However, it had gotten no further than the negative knowledge we had in the Twentieth Century, that a sick body dulls consciousness of the material world, and that knowledge, which all mankind has had from the beginning of time, that a dead body means a departed consciousness. They had succeeded in producing, by synthesis, what appeared to be living tissues, and even animals of moderately complex structure and rudimentary brains, but they could not give these creatures the full complement of life's characteristics, nor raise the brains to more than mechanical control of muscular tissues.

It was my own opinion that they never could succeed in doing so. This opinion impressed San-Lan greatly. I had expected him to snort his disgust, as the extreme school of evolutionists would have done in the Twentieth Century. But the idea was as new to him and the scientists of his court as Darwinism was to the late Nineteenth and Early Twentieth Centuries. So it was received with much respect. Painfully and with enforced mental readjustments, they began a philosophical search for excuses and justifications for the idea.

All of this amused me greatly, for of course neither the newness nor the orthodoxy of a hypothesis will make it true if it is not true, nor untrue if it is true. Nor could the luck or willpower, with which I had resisted their hypnotists and psychoanalysts, make what might or might not be a universal fact one whit more or less of a fact than it really was. But the prestige I had gained among them, and the novelty of my expressed opinion carried much weight with them.

Yet, did not even brilliant scientists frequently exhibit the same lack of logic back in the Twentieth Century? Did not the historians, the philosophers of ancient Greece and Rome show themselves to be the same shrewd observers as those of succeeding centuries, the same masters of the logical and slaves of the illogical?

After all, I reflected, man makes little progress within himself. Through succeeding generations he piles up those resources which he possesses outside of himself, the tools of his hands, and the warehouses of knowledge for his brain, whether they be parchment manuscripts, printed book, or electronorecordographs. For the rest he is born to-day, as in ancient Greece, with a blank

brain, and struggles through to his grave, with a more or less beclouded understanding, and with distinct limitations to what we used to call his "think tank."

This particular reflection of mine proved unpopular with them, for it stabbed their vanity, and neither my prestige nor the novelty of the idea was sufficient salve. These Hans for centuries had believed and taught their children that they were a super-race, a race of destiny. Destined to Whom, for What, was not so clear to them; but nevertheless destined to "elevate" humanity to some sort of super-plane. Yet through these same centuries they had been busily engaged in the extermination of "weaklings," whom, by their very persecutions, they had turned into "super men," now rising in mighty wrath to destroy them; and in reducing themselves to the depths of softening vice and flabby moral fiber. Is it strange that they looked at me in amazed wonder when I laughed outright in the midst of some of their most serious speculations?

CHAPTER IX

The Fall of Nu-Yok

MY position among the Hans, in this period, was a peculiar one. I was at once a closely guarded prisoner and an honored guest. San-Lan told me frankly that I would remain the latter only so long as I remained an object of serious study or mental diversion to himself or his court. I made bold to ask him what would be done with me when I ceased to be such.

"Naturally," he said, "you will be eliminated. What else? It takes the services of fifteen men altogether, to guard you; and men, you understand, cannot be produced and developed in less than eighteen years." He meditated frowningly for a moment. "That, by the way, is something I must take up with the Birth and Educational Bureau. They must develop some method of speeding growth, even at the cost of mental development. With your wild forest men getting out of hand this way, we are going to need greater resources of population, and need them badly.

"But," he continued more lightly, "there seems to be no need for you to disturb yourself over the prospect at present. It is true you have been able to resist our psychoanalysts and hypnotists, and so have no value to us from the viewpoint of military information, but as a philosopher, you have proved interesting indeed."

He broke off to give his attention to a gorgeously uniformed official who suddenly appeared on the large viewplate that formed one wall of the apartment. So perfectly did this mechanism operate, that the man might have been in the room with us. He made a low obeisance, then rose to his full height and looked at his ruler with malicious amusement.

"Heaven-Born," he said, "I have the exquisite pain of reporting bad news."

San-Lan gave him a scathing look. "It will be less unpleasant, perhaps, if I am not distracted by the sight of you while you report."

At this the man disappeared, and the viewplate once more presented its normal picture of the mountains North of Lo-Tan; but the voice continued:

"Heaven-Born, the Nu-Yok fleet has been destroyed, the city is in ruins, and the newly formed ground brigades, reduced to 10,000 men, have taken refuge in the hills of Ron-Dak (the Adirondacks) where they are being pressed hard by the tribesmen, who have surrounded them."

For an instant San-Lan sat as though paralyzed. Then he leaped to his feet, facing the viewplate.

"Let me see you!" he snarled. Instantly the mountain view disappeared and the Intelligence Officer appeared again, this time looking a little frightened.

"Where is Lui-Lok?" he shouted. "Cut him in on my North plate. The commander who loses his city dies by torture. Cut him in. Cut him in!"

"Heaven-Born, Lui-Luk committed suicide. He leaped into a ray, when rockets of the tribesmen began to penetrate the ray-wall. Lip-Hung is in command of the survivors. We have just had a message from him. We could not understand all of it. Reception was very weak because he is operating with emergency apparatus on Bah-Flo power. The Nu-Yok power broadcast plant has been blown up. Lip-Hung begs for a rescue fleet."

San-Lan, his expression momentarily becoming more vicious, now was striding up and down the room, while the poor wretch in the viewplate, thoroughly scared at last, stood trembling.

"What!" shrieked the tyrant. "He begs a rescue. A rescue of what? Of 10,000 beaten men and nothing better than makeshift apparatus? No fleet? No city? I give him and his 10,000 to the tribesmen! They are of no use to us now! Get out! Vanish! No, wait! Have any of the beasts' rockets penetrated the ray-walls of other cities?"

"No, Heaven-Born, no. It is only at Nu-Yok that the tribesmen used rockets sheathed in the same mysterious substance they use on their little aircraft and which cannot be disintegrated by the ray." (He meant inetrtron, of course.)

San-Lan waved his hand in dismissal. The officer dissolved from view, and the mountains once more appeared, as though the whole side of the room were of glass.

More slowly he paced back and forth. He was the caged tiger now, his face seamed with hate and the desperation of foreshadowed doom.

"Driven out into the hills," he muttered to himself. "Not more than 10,000 of them left. Hunted like beasts—and by the very beasts we ourselves have hunted for centuries. Cursed be our ancestors for letting a single one of the spawn live!" He shook his clenched hands above his head. Then, suddenly remembering me, he turned and glared.

"Forest man, what have you to say?" he demanded.

Thus confronted, there stole over me that same detached feeling that possessed me the day I had been made Boss of the Wyomings.

"It is the end of the Air Lords of Han," I said quietly. "For five centuries' command of the air has meant victory. But this is so no longer. For more than three centuries your great, gleaming cities have been impregnable in all their arrogant visibility. But that day is done also. Victory returns once more to the ground, to men invisible in the vast expanse of

the forest which covers the ruins of the civilization destroyed by your ancestors. Ye have sown destruction. Ye shall reap it!

"Your ancestors thought they had made mere beasts of the American race. Physically you did reduce them to the state of beasts. But men do have souls, San-Lan, and in their souls the Americans still cherished the spark of manhood, of honor, of independence. While the Hans have degenerated into a race of sleek, pampered beasts themselves, they have unwittingly bred a race of super-men out of those they sought to make animals. You have bred your own destruction. Your cities shall be blasted from their foundations. Your air fleets shall be brought crashing to earth. You have your choice of dying in the wreckage, or of fleeing to the forests, there to be hunted down and killed as you have sought to destroy us!"

And the ruler of all the Hans shrank back from my outstretched finger as though it had been in truth the finger of doom.

But only for a moment. Suddenly he snarled and crouched as though to spring at me with his bare hands. By a mighty convulsion of the will he regained control of himself, however, and assumed a manner of quiet dignity. He even smiled—a slow, crooked smile.

"No," he said, answering his own thought. "I will not have you killed now. You shall live on, my honored guest, to see with your own eyes how we shall exterminate your animal-brethren in their forests. With your own ears you shall hear their dying shrieks. The cold science of Han is superior to your spurious knowledge. We have been careless. To our cost we have let you develop brains of a sort. But we are still superior. We shall go down into the forests and meet you. We shall beat you in your own element. Then, when you have seen and heard this happen, my Council shall devise for you a death by scientific torture, such as no man in the history of the world has been honored with."

I MUST digress here a bit from my own personal adventures to explain briefly how the fall of Nu-Yok came about, as I learned it afterward.

Upon my capture by the Hans, my wife, Wilma, courageously had assumed command of my Gang, the Wyomings.

Boss Handan, of the Winslows, who was directing the American forces invading Nu-Yok, contented himself for several weeks with maintaining our lines, while waiting for the completion of the first supply of inetrtron-jacketed rockets. At last they arrived with a limited quantity of very high-powered atomic shells, a trifle over a hundred of them to be exact. But this number, it was estimated, would be enough to reduce the city to ruins. The rockets were distributed, and the day for the final bombardment was set.

The Hans, however, upset Handan's plans by launching a ground expedition up the west bank of the Hudson. Under cover of an air raid to the southwest, in which the bulk of their ships took part, this ground expedition shot northward in low-flying ships.

The raiding air fleet ploughed deep into our lines in their famous "cloud-bank" formation, with down-playing disintegrator rays so concentrated as to form a

virtual curtain of destruction. It seared a scarpath a mile and a half wide fifteen miles into our territory.

Everyone of our rocket gunners caught in this section was annihilated. Altogether we lost several hundred men and girls.

Gunners on each side of the raiding ships kept up a continuous fire on them. Most of the rockets were disintegrated, for Handan would not permit the use of the inertron rockets against the ships. But now and then one found its way through the playing beams, hit a repeller ray and was hurled up against a Han ship, bringing it crashing down.

The orders that Handan barked into his ultraphone were, of course, heard by every long-gunner in the ring of American forces around the city, and nearly all of them turned their fire on the Han airfleet, with the exception of those equipped with the inertron rockets.

These latter held to the original target and promptly cut loose on the city with a shower of destruction which the disintegrator-ray walls could not stop. The results staggered imagination, and produced awe even in our own ranks.

Where an instant before had stood the high-flung masses and towers of Nu-Yok, gleaming red, blue and gold in the brilliant sunlight, and shimmering through the iridescence of the ray "wall," there was a seething turmoil of gigantic explosions.

Surging billows of debris were hurled skyward on gigantic pulsations of blinding light, to the accompaniment of thunderous detonations that shook men from their feet in many sections of the American line seven and eight miles away.

As I have said, there were only some hundred of the inertron rockets among the Americans, long and slender, to fit the ordinary guns, but the atomic laboratories hidden beneath the forests, had outdone themselves in their construction. Their release of atomic force was nearly 100 per cent, and each one of them was equal to many hundred tons of trinitrotoluol, which I had known in the First World War, five hundred years before, as "T.N.T."

It was all over in a few seconds. Nu-Yok had ceased to exist, and the waters of the bay and the rivers were pouring into the vast hole where a moment before had been the rocky strata beneath lower Manhattan.

Naturally, with the destruction of the city's power-broadcasting plant the Han air fleet had plunged to earth.

But the ships of the ground expedition up the river, hugging the tree tops closely, had run the gauntlet of the American long-gunners who were busily shooting at the other Han fleet, high in the air to the southwest, and about half of them had landed before their ships were robbed of their power. The other half crashed, taking some 10,000 or 12,000 Han troops to destruction with them. But from those which had landed safely, emerged the 10,000 who now were the sole survivors of the city, and who took refuge in wooded fastnesses of the Adirondacks.

The Americans with their immensely greater mobility, due to their jumping belts and their familiarity with the forest, had them ringed in within twenty-four hours.

But owing to the speed of the maneuvers, the lines

were not as tightly drawn as they might have been, and there was considerable scattering of both American and Han units. The Hans could make only the weakest short-range use of their newly developed disintegrator-ray field units, since they had only distant sources of power-broadcast on which to draw. On the other hand, the Americans could use their explosive rockets only sparingly for fear of hitting one another.

So the battle was finished in a series of desperate hand to hand encounters in the ravines and mountain slopes of the district.

The Mifflins and Altoonas, themselves from rocky, mountainous sections, gave a splendid account of themselves in this fighting, leaping to the craggy slopes above the Hans, and driving them down into the ravines, where they could safely concentrate on them the fire of depressed rocket guns.

The Susquannas, with their great inertron shields, which served them well against the weak rays of the Hans, pressed forward irresistibly every time they made a contact with a Han unit, their short-range rocket guns sending a hail of explosive destruction before them.

But the Delawares, with their smaller shields, inertron leg-guards and helmets, and their ax-guns, made faster work of it. They would rush the Hans, shooting from their shields as they closed in, and finish the business with their ax-blades and the small rocket guns that formed the handles of their axes.

It was my own unit of Wyomings, equipped with bayonet guns not unlike the rifles of the First World War, that took the most terrible toll from the Hans.

They advanced at the double, laying a continuous barrage before them as they ran, closing with the enemy in great leaps, cutting, thrusting and slicing with those terrible double-ended weapons in a vicious efficiency against which the Hans with their swords, knives and spears were utterly helpless.

And so my prediction that the war would develop hand-to-hand fighting was verified at the outset.

None of the details of this battle of the Ron Daks were ever known in Lo-Tan. Not more than the barest outlines of the destruction of the survivors of Nu-Yok were ever received by San-Lan and his Council. And of course, at that time I knew no more about it than they did.

CHAPTER X

Life In Lo-Tan, the Magnificent

SAN-LAN'S attitude toward me underwent a change. He did not seek my company as he had done before, and so those long discussions and mental duels in which we pitted our philosophies against each other came to an end. I was, I suspected, an unpleasant reminder to him of things he would rather forget, and my presence was an omen of impending doom. That he did not order my execution forthwith was due, I believe, to a sort of fascination in me, as the personification of this (to him) strange and mysterious race of super-men who had so magically developed overnight from "beasts" of the forest.

But though I saw little of him after this, I remained a member of his household, if one may speak of a

"household" where there is no semblance of house.

The imperial apartments were located at the very summit of the Imperial Tower, the topmost pinnacle of the city, itself clinging to the sides and peak of the highest mountain in that section of the Rockies. There were days when the city seemed to be built on a rugged island in the midst of a sea of fleecy whiteness, for frequently the cloud level was below the peak. And on such days the only visual communication with the world below was through the viewplates which formed nearly all the interior walls of the thousands of apartments (for the city was, in fact, one vast building) and upon which the tenants could tune in almost any views they wished from an elaborate system of public television and projectoscope broadcasts.

Every Han city had many public-view broadcasting stations, operating on tuning ranges which did not interfere with other communication systems. For slight additional fees a citizen in Lo-Tan might, if he felt so inclined, "visit" the seashore, or the lakes or the forests of any part of the country, for when such scene was thrown on the walls of an apartment, the effect was precisely the same as if one were gazing through a vast window at the scene itself.

It was possible too, for a slightly higher fee, to make a mutual connection between apartments in the same or different cities, so that a family in Lo-Tan, for instance, might "visit" friends in Fis-Ko (San Francisco) taking their apartment, so to speak, along with them; being to all intents and purposes separated from their "hosts" only by a big glass wall which interfered neither with vision nor conversation.

These public view and visitation projectoscopes explain that utter depth of laziness into which the Hans had been dragged by their civilization. There was no incentive for anyone to leave his apartment unless he was in the military or air service, or a member of one of the repair services which from time to time had to scoot through the corridors and shafts of the city, somewhat like the ancient fire departments, to make some emergency repair to the machinery of the city or its electrical devices.

Why should he leave his house? Food, wonderful synthetic concoctions of any desired flavor and consistency (and for additional fee conforming to the individual's dietary prescription) came to him through a shaft, from which his tray slid automatically on to a convenient shelf or table.

At will he could tune in a theatrical performance of talking pictures. He could visit and talk with his friends. He breathed the freshest of filtered air right in his own apartment, at any temperature he desired, fragrant with the scent of flowers, the aromatic smell of the pine forests or the salt tang of the sea, as he might prefer. He could "visit" his friends at will, and though his apartment actually might be buried many thousand feet from the outside wall of the city, it was none the less an "outside" one, by virtue of its viewplate walls. There was even a tube system, with trunk, branch and local lines and an automagnetic switching system, by which articles within certain size limits could be despatched from any apartment to any other one in the city.

The women actually moved about through the city more than the men, for they had no fixed duties. No work was required of them, and though nominally free, their dependence upon the government pension for their necessities and on their "husbands" (of the moment) for their luxuries, reduced them virtually to the condition of slaves.

Each had her own apartment in the Lower City, with but a single small viewplate, very limited "visitation" facilities, and a minimum credit for food and clothing. This apartment was assigned to her on graduation from the State School, in which she had been placed as an infant, and it remained hers so long as she lived, regardless of whether she occupied it or not. At the conclusion of her various "marriages" she would return there, pending her endeavors to make a new match. Naturally, as her years increased, her returns became more frequent and her stay of longer duration, until finally, abandoning hope of making another match, she finished out her days there, usually in drunkenness and whatever other forms of cheap dissipation she could afford on her dole, starving herself.

Men also received the same State pension, sufficient for the necessities but not for the luxuries of life. They got it only as an old-age pension, and on application.

When boys graduated from the State School they generally were "adopted" by their fathers and taken into the latter's households, where they enjoyed luxuries far in excess of their own earning power. It was not that their fathers wasted any affection on them, for as I have explained before, the Hans were so morally atrophied and scientifically developed that love and affection, as we Americans knew them, were unexperienced or suppressed emotions with them. They were replaced by lust and pride of possession. So long as it pleased a father's vanity, and he did not miss the cost, he would keep a son with him, but no longer.

Young men, of course, started to work at the minimum wage, which was somewhat higher than the pension. There was work for everybody in positions of minor responsibility, but very little hard work.

Upon receiving his appointment from one or another of the big corporations which handled the production and distribution of the vast community (the shares of which were pooled and held by the government—that is, by San-Lan himself—in trust for all the workers, according to their positions) he would be assigned to an apartment-office, or an apartment adjoining the group of offices in which he was to have his desk. Most of the work was done in single apartment-offices.

The young man, for instance, might recline at his ease in his apartment near the top of the city, and for three or four hours a day inspect, through his viewplate and certain specially installed apparatus, the output of a certain process in one of the vast automatically controlled food factories buried far underground beneath the base of the mountain, where the moan of its whirling and throbbing machinery would not disturb the peace and quiet of the citizens on the mountain top. Or he might be required simply to watch the operation of an account machine in an automatic store.

There is no denying that the economic system of the Hans was marvelous. A suit of clothes, for instance,

might be delivered in a man's apartment without a human hand having ever touched it.

Having decided that he wished a suit of a given general style, he would simply tune in a visual broadcast of the display of various selections, and when he had made his choice, dial the number of the item and press the order button. Simultaneously the charge would be automatically made against his account number, and credited as a sale on the automatic records of that particular factory in the account house. And his account plate, hidden behind a little wall door, would register his new credit balance. An automatically packaged suit that had been made to style and size-standard by automatic machinery from synthetically produced material, would slip into the delivery chute, magnetically addressed, and in anywhere from a few seconds to thirty minutes or so, according to the volume of business in the chutes, and drop into the delivery basket in his room.

DAILY his wages were credited to his account, and monthly his share of the dividends likewise (according to his position) from the Imperial Investment Trust, after deduction of taxes (through the automatic bookkeeping machines) for the support of the city's pensioners and whatever sum San-Lan himself had chosen to deduct for personal expenses and gratuities.

A man could not bequeath his ownership interest in industry to his son, for that interest ceased with his death, but his credit accumulation, on which interest was paid, was credited to his eldest recorded son as a matter of law.

Since many of these credit fortunes (The Hans had abandoned gold as a financial basis centuries before) were so big that they drew interest in excess of the utmost luxury costs of a single individual, there was a class of idle rich consisting of eldest sons, passing on these credit fortunes from generation to generation. But younger sons and women had no share in these fortunes, except by the whims and favor of the "Man-Dins" (Mandarins), as these inheritors were known.

These Man-Dins formed a distinct class of the population, and numbered about five per cent of it. It was distinct from the Ku-Li (coolie) or common people, and from the "Ki-Ling" or aristocracy composed of those more energetic men (at least mentally more energetic) who were the active or retired executive heads of the various industrial, educational, military or political administrations.

A man might, if he so chose, transfer part of his credit to a woman favorite, which then remained hers for life or until she used it up, and of course the prime object of most women, whether as wives, or favorites, was to beguile a settlement of this sort out of some wealthy man.

When successful in this, and upon reassuming her freedom, a woman ranked socially and economically with the Man-Dins. But on her death, whatever remained of her credit was transferred to the Imperial fund.

When one considers that the Hans, from the days of their exodus from Mongolia and their conquest of America, had never held any ideal of monogamy, and the fact that marriage was but a temporary formality

which could be terminated on official notice by either party, and that after all it gave a woman no real rights or prerogatives that could not be terminated at the whim of her husband, and established her as nothing but the favorite of his harem, if he had an income large enough to keep one, or the most definitely acknowledged of his favorites if he hadn't, it is easy to see that no such thing as a real family life existed among them.

Free women roamed the corridors of the city, pathetically importuning marriage, and wives spent most of the time they were not under their husbands' watchful eyes in flirtatious attempts to provide themselves with better prospects for their next marriages.

Naturally the biggest problem of the community was that of stimulating the birth rate. The system of special credits to mothers had begun centuries before, but had not been very efficacious until women had been deprived of all other earning power, and even at the time of which I write it was only partially successful, in spite of the heavy bounties for children. It was difficult to make the bounties sufficiently attractive to lure the women from their more remunerative light flirtations. Eugenic standards also were a handicap.

As a matter of fact, San-Lan had under consideration a revolutionary change in economic and moral standards, when the revolt of the forest men upset his delicately laid plans, for, as he had explained to me, it was no easy thing to upset the customs of centuries in what he was pleased to call the "morals" of his race.

He had another reason too. The physically active men of the community were beginning to acquire a rather dangerous domination. These included men in the army, in the airships, and in those relatively few civilian activities in which machines could not do the routine work and thinking. Already common soldiers and air crews demanded and received higher remuneration than all except the highest of the Ki-Ling, the industrial and scientific leaders, while mechanics and repairmen who could, and would, work hard physically, commanded higher incomes than Princes of the Blood, and though constituting only a fraction of one per cent of the population they actually dominated the city. San-Lan dared take no important step in the development of the industrial and military system without consulting their council or Yun-Yun (Union), as it was known.

Socially the Han cities were in a chaotic condition at this time, between morals that were not morals, families that were not families, marriages that were not marriages, children who knew no homes, work that was not work, eugenics that didn't work; Ku-Lis who envied the richer classes but were too lazy to reach out for the rewards freely offered for individual initiative; the intellectually active and physically lazy Ki-Lings who despised their lethargy; the Man-Din drones who regarded both classes with supercilious toleration; the Princes of the Blood, arrogant in their assumption of a heritage from a Heaven in which they did not believe; and finally the three castes of the army, air and industrial repair services, equally arrogant and with more reason in their consciousness of physical power.

The army exercised a cruelly careless and impartial police power over all classes, including the airmen, when the latter were in port. But it did not dare to touch the repair men, who, so far as I could ever make out, roamed the corridors of the city at will during their hours off duty, wreaking their wills on whomever they met, without let or hindrance.

Even a Prince of the Blood would withdraw into a side corridor with his escort of a score of men, to let one of these labor "kings" pass, rather than risk an altercation which might result in trouble for the government with the Yun-Yun, regardless of the rights and wrongs of the case, unless a heavy credit transference was made from the balance of the Prince to that of the worker. For the machinery of the city could not continue in operation a fortnight, before some accident requiring delicate repair work would put it partially out of commission. And the Yun-Yun was quick to resent anything it could construe as a slight on one of its members.

In the last analysis it was these Yun-Yun men, numerically the smallest of the classes, who ruled the Han civilization, because for all practical purposes they controlled the machinery on which that civilization depended for its existence.

Politically, San-Lan could balance the organizations of the army and the air fleets against each other, but he could not break the grip of the repairmen on the machinery of the cities and the power broadcast plants.

CHAPTER XI

The Forest Men Attack

MANY times during the months I remained prisoner among the Hans I had tried to develop a plan of escape, but could conceive of nothing which seemed to have any reasonable chance of success.

While I was allowed almost complete freedom within the confines of the city, and sometimes was permitted to visit even the military outposts and disintegrator ray batteries in the surrounding mountains, I was never without a guard of at least five men under the command of an officer. These men were picked soldiers, and they were armed with powerful though short-range disintegrator-ray pistols, capable of annihilating anything within a hundred feet. Their vigilance never relaxed. The officer on duty kept constantly at my side, or a couple of paces behind me, while certain of the others were under strict orders never to approach within my reach, nor to get more than forty feet away from me. The thought occurred to me once to seize the officer at my side and use him as a shield, until I found that the guard were under orders to destroy both of us in such a case.

So in this fashion I roamed the city corridors, wherever I wished. I visited the great factories at the bottom of the shafts that led to the base of the mountain, where, unattended by any mechanics, great turbines whirled and moaned, giant pistons plunged back and forth, and immense systems of chemical vats, piping and converters, automatically performed their functions with the assistance of no human hand, but under the minute television inspection of many perfumed dandies

reclining at their ease before viewplates in their apartment offices in the city, that clung to the mountain peak far above.

There were just two restrictions on my freedom of movement. I was allowed nowhere near the power broadcasting station on the peak, nor the complement of it which was buried three miles below the base of the mountain. And I was never allowed to approach within a hundred feet of any disintegrator ray machine when I visited the military outposts in the surrounding mountains.

I first noticed the "escape tunnels" one day when I had descended to the lowest level of all, the location of the Electronic Plant, where machines, known as "reverse disintegrators," fed with earth and crushed rock by automatic conveyors, subjected this material to the disintegrator ray, held the released electrons captive within their magnetic fields and slowly refashioned them into supplies of metals and other desired elements.

My attention was attracted to the tunnels by the unusual fact that men were busily entering and leaving them. Almost the entire repair force seemed to be concentrated here. Stocky, muscular men they were, with the same modified Oriental countenances as the rest of the Hans, but with a certain ruggedness about them that was lacking in the rest of the indolent population. They sweated as they labored over the construction of magnetic cars evidently designed to travel down these tunnels, automatically laying pipe lines for ventilation and temperature control. The tunnels themselves appeared to have been driven with disintegrator rays, which could bore rapidly through the solid rock, forming glassy iridescent walls as they bored, and involving no problem of debris removal.

I asked San-Lan about it the next time I saw him, for the officer of my guard would give me no information.

The supreme ruler of the Hans smiled mockingly.

"There is no reason why you should not know their purpose," he said, "for you will never be able to stop our use of them. These tunnels constitute the road to a new Han era. Your forest men have turned our cities into traps, but they have not trapped our minds and our powers over Nature. We are masters still; masters of the world, and of the forest men.

"You have revolutionized the tactics of warfare with your explosive rockets and your strategy of fighting from concealed positions, miles away, where we cannot find you with our beams. You have driven our ships from the air, and you may destroy our cities. But we shall be gone.

"Down these tunnels we shall depart to our new cities, deep under ground, and scattered far and wide through the mountains. They are nearly completed now.

"You will never blast us out of these, even with your most powerful explosives, because they will be more difficult for you to find than it is for us to locate a forest gunner somewhere beneath his leafy screen of miles of trees, and because they will be too far underground."

"But," I objected, "man cannot live and flourish like a mole continually removed from the light of day, with-

out the health-giving rays of the sun, which man needs."

"No?" San-Lan jeered. "Wild tribesmen might not be able to, but we are a civilization. We shall make our own sunlight to order in the bowels of the earth. If necessary, we can manufacture our air synthetically; not the germ-laden air of Nature, but absolutely pure air. Our underground cities will be heated or refrigerated artificially as conditions may require. Why should we not live underground if we desire? We produce all our needs synthetically.

"Nor will you be able to locate our cities with electronic indicators.

"You see, Rogers, I know what is in your mind. Our scientists have planned carefully. All our machinery and processes will be shielded so that no electronic disturbances will exist at the surface.

"And then, from our underground cities we will emerge at leisure to wage merciless war on your wild men of the forest, until we have at last done what our forefathers should have done, exterminated them to the last beast."

HE thrust his jeering face close to mine. "Have you any answer to that?" he demanded.

My impulse was to plant my fist in his face, for I could think of no other answer. But I controlled myself, and even forced a hearty laugh, to irritate him.

"It is a fine plan," I admitted, "but you will not have time to carry it through. Long before you can complete your new cities you will have been destroyed."

"They will be completed within the week," he replied triumphantly. "We have not been asleep, and our mechanical and scientific resources make us masters of time as well as the earth. You shall see."

Naturally I was worried. I would have given much if I could have passed this information on to our chiefs.

But two days later a mighty exultation arose within me, when from far to the East and also to the South there came the rolling and continuous thunder of rocket fire. I was in my own apartment at the time. The Han captain of my guard was with me, as usual, and two guards stood just within the door. The others were in the corridor outside. And as soon as I heard it, I questioned my jailer with a look. He nodded assent, and I did what probably every disengaged person in Lo-Tan did at the same moment, tuned in on the local broadcast of the Military Headquarters View and Control Room.

It was as though the side wall of my apartment had dissolved, and we looked into a large room or office which had no walls or ceiling, these being replaced by the interior surface of a hemisphere, which was in fact a vast viewplate on which those in the room could see in every direction. Some 200 staff officers had their desks in this room. Each desk was equipped with a system of small viewplates of its own, and each officer was responsible for a given directional section of the "map," and busied himself with teleprojectoscope examination of it, quite independently of the general view thrown on the dome plate.

At a raised circular desk in the center, which was composed entirely of viewplates, sat the Executive Marshal, scanning the hemisphere, calling occasionally

for telescopic views of one section or another on his desk plates, and noting the little pale green signal lights that flashed up as Sector Observers called for his attention.

Members of Strategy Board, Base Commanders of military units, and San-Lan himself, I understood, sat at similar desks in their private offices, on which all these views were duplicated, and in constant verbal and visual communication with one another and with the Executive Marshal.

The particular view which appeared on my own wall fortunately showed the East side of the dome viewplate, and in one corner of my picture appeared the Executive Marshal himself.

Although I was getting a viewplate picture of a viewplate picture, I could see the broad, rugged valley to the East plainly, and the relatively low ridge beyond, which must have been some thirty miles away.

It was beyond this, evidently far beyond it, that the scene of the action was located, for nothing showed on the plate but a misty haze permeated by indefinite and continuous pulsations of light, and against which the low mountain ridge stood out in bold relief.

Somewhere on the floor of the Observation room, of course, was a Sector Observer who was looking beyond that ridge, probably through a projectoscope station in the second or third "circle," located perhaps on that ridge or beyond it.

At the very moment I was wishing for his facilities the Executive Marshal leaned over to a microphone and gave an order in a low tone. The hemispherical view dissolved, and another took its place, from the third circle. And the view was now that which would be seen by a man standing on the low distant ridge.

There was another broad valley, a wide and deep canyon, in fact, and beyond this still another ridge, the outlines of which were already beginning to fade into the on-creeping haze of the barrage. The flashes of the great detonating rockets were momentarily becoming more vivid.

"That's the Gok-Man ridge," mused the Han officer beside me in the apartment, "and the Forest Men must be more than fifty miles beyond that."

"How do you figure that?" I asked curiously.

"Because obviously they have not penetrated our scout lines. See that line of observers nearest the dome itself. They're all busy with their desk plates. They're in communication with the scout line. The scout line broadcast is still in operation. It looks as though the line is still unpierced, but the tribesmen's rockets are sailing over and falling this side of it."

All through the night the barrage continued. At times it seemed to creep closer and then recede again. Finally it withdrew, pulling back to the American lines, to alternately advance and recede. At last I went to sleep. The Han officer seemed to be a relatively good-natured fellow, for one of his race, and he promised to awake me if anything further of interest took place.

He didn't though. When I awoke in the morning, he gave me a brief outline of what had happened.

It was pieced together from his own observations and the public news broadcast.

CHAPTER XII

The Mysterious "Air Balls"

THE American barrage had been a long distance bombardment, designed, apparently, to draw the Han disintegrator ray batteries into operation and so reveal their positions on the mountain tops and slopes, for the Hans, after the destruction of Nu-Yok, had learned quickly that concealment of their positions was a better protection than a surrounding wall of disintegrator rays shooting up into the sky.

The Hans, however, had failed to reply with disintegrator rays. For already this arm, which formerly they had believed invincible, was being restricted to a limited number of their military units, and their factories were busy turning out explosive rockets not dissimilar to those of the Americans in their motive power and atomic detonation. They had replied with these, shooting them from unrevealed positions, and at the estimated positions of the Americans.

Since the Americans, not knowing the exact location of the Han outer line, had shot their barrage over it, and the Hans had fired at unknown American positions, this first exchange of fire had done little more than to churn up vast areas of mountain and valley.

The Hans appeared to be elated, to feel that they had driven off an American attack. I knew better. The next American move, I felt, would be the occupation of the air, from which they had driven the Hans, and from swoopers to direct the rocket fire at the city itself. Then, when they had destroyed this, they would sweep in and hunt down the Hans, man to man, in the surrounding mountains. Command of the air was still important in military strategy, but command of the air rested no longer in the air, but on the ground.

The Hans themselves attempted to scout the American positions from the air, under cover of a massed attack of ships in "cloud bank" or beaming formation, but with very little success. Most of their ships were shot down, and the remainder slid back to the city on sharply inclined repeller rays, one of them which had had its generators badly damaged while still fifty miles out, collapsed over the city, before it could reach its berth at the airport, and crashed down through the glass roof of the city, doing great damage.

Then followed the "air balls," an unforeseen and ingenious resurrection by the Americans of an old principle of air and submarine tactics, through a modern application of the principle of remote control.

The air balls took heavy toll of the morale of the Hans before they were clearly understood by them, and even afterward for that matter.

Their first appearance was quite mysterious. One uneasy night, while the pulsating growl of the distant barrage kept the nerves of the city's inhabitants on edge, there was an explosion near the top of a pinnacle not far from the Imperial Tower. It occurred at the 732nd level, and caused the structure above it to lean and sag, though it did not fall.

Repair men who shot up the shafts a few minutes later to bring new broadcast lamps to replace those which had been shattered, reported what seemed to be a sphere of metal, about three feet in diameter, with a four-inch

lens in it, floating slowly down the shaft, as though it were some living creature making a careful examination, pausing now and then as its lens swung about like a great single eye. The moment this "eye" turned upon them, they said, the ball "rushed" down on them, crushing several to death in its vicious gyrations, and jamming the mechanism of the elevator, though failing to crash through it. Then, said the wounded survivors, it floated back up the shaft, watchfully "eyeing" them, and slipped off to the side at the wrecked level.

The next night several of these "air balls" were seen, following explosions in various towers and sections of the city roof and walls. In each case repair gangs were "rushed" by them, and suffered many casualties. On the third night a few of the air balls were destroyed by the repair men and guards, who now were equipped with disintegrator pistols.

This, however, was pretty costly business, for in each case the ray bored into the corridor and shaft walls beyond its target, wrecking much machinery, injuring the structural members of that section, penetrating apartments and taking a number of lives. Moreover, the "air balls," being destroyed, could not be subjected to scientific inspection.

After this the explosions ceased. But for many days the sudden appearances of these "air balls" in the corridors and shafts of the city caused the greatest confusion, and many times they were the cause of death and panic.

At times they released poison gases, and not infrequently themselves burst, instead of withdrawing, in a veritable explosion of disease germs, requiring absolute quarantine by the Han medical department.

There was an utter heartlessness about the defense of the Han authorities, who considered nothing but the good of the community as a whole; for when they established these quarantines, they did not hesitate to seal up thousands of the city's inhabitants behind hermetic barriers enclosing entire sections of different levels, where deprived of food and ventilation, the wretched inhabitants died miserably, long before the disease germs developed in their systems.

AT the end of two weeks the entire population of the city was in a mood of panicky revolt. News service to the public had been suspended, and the use of all viewplates and 'phones in the city were restricted to official communications. The city administration had issued orders that all citizens not on duty should keep to their apartments, but the order was openly flouted, and small mobs were wandering through the corridors, ascending and descending from one level to another, seeking they knew not what, fleeing the air balls, which might appear anywhere, and being driven back from the innermost and deepest sections of the city by the military guard.

I now made up my mind that the time was ripe for me to attempt my escape. In all this confusion I might have an even break, in spite of the danger I might myself run from the air balls, and the almost insuperable difficulties of making my way to the outside of the city and down the precipitous walls of the mountain to which the city clung like a cap. I would have given

much for my inertron belt, that I might simply have leaped outward from the edge of the roof some dark night and floated gently down. I longed for my ultraphone equipment, with which I might have established communication with the beleaguering American forces.

My greatest difficulty, I knew, would be that of escaping my guard. Once free of them, I figured it would be the business of nobody in particular, in that badly disorganized city, to recapture me. The knives of the ordinary citizens I did not fear, and very few of the military guard were armed with disintegrator pistols.

I was sitting in my apartment busying my mind with various plans, when there occurred a commotion in the city corridor outside my door. The Captain of my guard jumped nervously from the couch on which he had been reclining, and ordered the excited guards to open the door.

In the broad corridor, the remainder of the guard lay about, dead or groaning, where they had been bowled over by one of these air balls, the first I had ever seen.

The metal sphere floated hesitantly above its victims, turning this way and that to bring its "eye" on various objects around. It stopped dead on sighting the door the guard had thrown open, hesitated a moment, and then shot suddenly into the apartment with a hissing sound, flinging into a far corner one of the guards who had not been quick enough to duck. As the Captain drew his disintegrator pistol, it launched itself at him with a vicious hiss. He bounded back from the impact, his chest crushed in, while his pistol, which fortunately had fallen with its muzzle pointed away from me, shot a continuous beam that melted its way instantly through the wall of the apartment.

The sphere then turned on the other guard, who had thrown himself into a corner where he crouched in fear. Deliberately it seemed to gauge the distance and direction. Then it hurled itself at him with another vicious hiss, which I now saw came from a little rocket motor, crushing him to death where he lay.

It swung slowly around until the lens faced me again, and floated gently into position level with my face, seeming to scan me with its blank, four-inch eye. Then it spoke, with a metallic voice.

"If you are an American," it said, "answer with your name, gang and position."

"I am Anthony Rogers," I replied, still half bewildered, "Boss of the Wyomings. I was captured by the Hans after my swooper was disabled in a fight with a Han airship and had drifted many hundred miles westward. These Hans you have killed were my guard."

"Good!" ejaculated the metal ball. "We have been hunting for you with these remote control rockets for two weeks. We knew you had been captured. A Han message was picked up. Close the door of your room, and hide this ball somewhere. I have turned off the rocket power. Put it on your couch. Throw some pillows over it. Get out of sight. We'll speak softly, so no Hans can hear, and we'll speak only when you speak to us."

The ball, I found, was floating freely in the air. So perfectly was it balanced with ultron and inertron that

it had about the weight of a spider web. Ultimately, I suppose, it would have settled to the floor. But I had no time for such an idle experiment. I quickly pushed it to my couch, where I threw a couple of pillows and some of the bed clothes over it. Then I threw myself back on the couch with my head near it. If the dead guards outside attracted attention, and the Han patrol entered, I could report the attack by the "air ball" and claim that I had been knocked unconscious by it.

"One moment," said the ball, after I reported myself ready to talk. "Here is someone who wants to speak to you." And I nearly leaped from the couch with joy when, despite the metallic tone of the instrument, I recognized the eager, loving voice of my wife, almost hysterical in her own joy at talking to me again.

CHAPTER XIII

Escape!

WE had little time, however, to waste in endearments, and very little to devote to informing me as to the American plans. The essential thing was that I report the Han plans and resources to the fullest of my ability. And for an hour or two I talked steadily, giving an outline of all I had learned from San-Lan and his Councillors, and particularly of the arrangements for drawing off the population of the city to new cities concealed underground, through the system of tunnels radiating from the base of the mountain. And as a result, the Americans determined to speed up their attack.

There were, as a matter of fact, only two relatively small commands facing the city, Wilma told me, but both of them were picked troops of the new Federal Council. Those to the South were a division of veterans who a few weeks before had destroyed the Han city of Sa-Lus (St. Louis). On the East were a number of the Colorado Gangs and an expeditionary force of our own Wyomings. The attack on Lo-Tan was intended chiefly as an attack on the morale of the Hans of the other twelve cities. If there seemed to be a chance of victory, the operations were to be pushed through. Otherwise the object would be to do as much damage as possible, and fade away into the forests if the Hans developed any real pressure with their new infantry and field batteries of rocket guns and disintegrator rays.

The "air balls" were simply miniature swoopers of spherical shape, ultronically controlled by operators at control boards miles away, and who saw on their viewplates whatever picture the ultronic television lens in the sphere itself picked up at the predetermined focus. The main propulsive rocket motor was diametrically opposite the lens, so that the sphere could be steered simply by keeping the picture of its objective centered on the crossed hairlines of the viewplates. The outer shell moved magnetically as desired with respect to the core, which was gyroscopically stabilized. Auxiliary rocket motors enabled the operator to make a sphere move sideways, backward or vertically.

Some of these spheres were equipped with devices which enabled their operators to hear as well as see through their ultronic broadcasts, and most of those

which had invaded the interior of Lo-Tan were equipped with "speakers," in the hope of finding me and establishing communication. Still others were equipped for two-stage control. That is, the operator control led the vision sphere, and through it watched and steered an air torpedo that travelled ahead of it.

The Han airship or any other target selected by the operator of such a combination was doomed. There was no escape. The spheres and torpedoes were too small to be hit. They could travel with the speed of bullets. They could trail a ship indefinitely, hover a safe distance from their mark, and strike at will. Finally, neither darkness nor smoke screens were any bar to their ultronic vision. The spheres, which had penetrated and explored Lo-Tan in their search for me, had floated through breaches in the walls and roofs made by their advance torpedoes.

Wilma had just finished explaining all this to me when I heard a noise outside my door. With a whispered warning I flung myself back on the couch and simulated unconsciousness. When I did not answer the poundings and calls to open, a police detail broke in and shook me roughly.

"The air ball," I moaned, pretending to regain consciousness slowly. "It came in from the corridor. Look, what it did to the guard. It must have grazed my head. Where is it?"

"Gone," muttered the under-officer, looking fearfully around. "Yes, undoubtedly gone. These men have been dead some time. And this pistol. The ball got him before he had a chance to use it. See, it has beamed through the wall only here, where he dropped it. Who are you? You look like a tribesman. Oh, yes, you're the Heaven Born's special prisoner. Maybe I ought to beam you right now. Good thing. Everyone would call it an accident. By the Grand Dragon, I will!"

WHILE he was talking, I had staggered to the other side of the room, to draw his attention away from the couch where the ball was concealed.

Now suddenly the pillows burst apart, and a blanket with which I had covered the thing streaked from the couch, hitting the man in the small of the back. I could hear his spine snap under the impact. Then it shot through the air toward the group of soldiers in the doorway, bowling them over and sending them shrieking right and left along the corridor. Relentlessly and with amazing speed it launched itself at each in turn, until the corpses lay grotesquely strewn about, and not one had escaped.

It returned to me for all the world like an old-fashioned ghost, the blanket still draped over it (and not interfering with its ultronic vision in the least) and "stood" before me.

"The yellow devils were going to kill you, Tony," I heard Wilma's voice saying. "You've got to get out of there, Tony, before you are killed. Besides, we need you at the control boards, where you can make real use of your knowledge of the city. Have you your jumping belt, ultraphone and rocket gun?"

"No," I replied. "They are all gone."

"It would be no good for you to try to make your

way to one of the breaches in the wall, nor to the roof," she refused.

"No, they are too well guarded," I replied, "and even if you made a new one at a predetermined spot I'm afraid the repair men and the patrol would go to it ahead of me."

"Yes, and they would beam you before you could climb inside of a swooper," she added.

"I'll tell you what I can do, Wilma," I suggested. "I know my way about the city pretty well. Suppose I go down one of the shafts to the base of the mountain. I think I can get out. It is dark in the valley, so the Hans cannot see me, and I will stand out in the open, where your ultrascopes can pick me up. Then a swooper can drop quickly down and get me."

"Good!" Wilma said. "But take that Han's disintegrator pistol with you. And go right away, Tony. But wrap this ball in something and carry it with you. Just toss it from you if you are attacked. I'll stay at the control board and operate it in case of emergency."

So I picked up ball and pistol, and thrust the hand in which I held it into the loose Han blouse I wore, wrapped the ball in a piece of sheeting, and stepped out in the corridor, hurrying toward the nearest magnetic car station, a couple of hundred feet down the corridor, for I had to cross nearly the entire width of the city to reach the shaft that went to the base of the mountain.

I thanked Providence for the perfection of the Han mechanical devices when I reached the station. The automatic checking system of these cars made station attendants unnecessary. I had only to slip the key I had taken from the dead Han officer into the account-charging machine at the station to release a car.

Pressing the proper combinations of main and branch line buttons, I seated myself, holding the pistol ready but concealed beneath my blouse. The car shot with rapid acceleration down the narrow tunnel.

The tubes in which these magnetic cars (which slid along a few inches above the floor of the tunnel by localized repeller rays) ran were very narrow, just the width of the car, and my only danger would come if on catching up to another car its driver should turn around and look in my face. If I kept my face to the front, and hunched over so as to conceal my size, no driver of a following car would suspect that I was not a Han like himself.

The tube dipped under traffic as it came to a trunk line, and my car magnetically lagged, until an opening in the traffic permitted it to swing swiftly into the main line tunnel. At the automatic distance of ten feet it followed a car in which rode a scantily clad girl, her flimsy silks fluttering in the rush of air. I cursed my luck. She would be far more likely to turn around than a man, to see if a man were in the car behind, and if he were personable—for not even the impending doom of the city and the public demoralization caused by the "air balls" had dulled the proclivities of the Han women for brazen flirtation. And turn around she did.

Before I could lower my head she had seen my face, and knew I was no Han. I saw her eyebrows arch in surprise. But she seemed puzzled rather than scared. Before she could make up her mind about me, however, her car had swung out of the main tunnel on its pre-

determined course, and my own automatically was closing up the gap to the car ahead. The passenger in this one wore the uniform of a medical officer, but he did not turn around before I swung out of main traffic to the little station at the head of the shaft.

This particular shaft was intended to serve the very lowest levels exclusively, and since its single car carried nothing but express traffic, it was used only by repair men and other specialists who occasionally had to descend to those levels.

THERE were only three people on the little platform, which reminded me much of the subway stations of the Twentieth Century. Two men and a girl stood facing the gate of the shaft, waiting for the car to return from below. One of these was a soldier, apparently off duty, for though he wore the scarlet military coat he carried no weapons other than his knife. The other man wore nothing but sandals and a pair of loose short pants of some heavy and serviceable material. I did not need to look at the compact tool kit and the ray machines attached to his heavy belt, nor the gorgeously jewelled armlet and diadem that he wore to know him for a repair man.

The girl was quite scantily clad, but wore a mask, which was not unusual among the Han women when they went forth on their flirtatious expeditions, and there was something about the sinuous grace of her movements that seemed familiar to me. She was making desperate love to the repair man, whose attitude toward her was that of pleased but lofty tolerance. The soldier, who was seeking no trouble, occupied himself strictly with his own thoughts and paid little attention to them.

I stepped from my car, still carrying my bundle in which the "air ball" was concealed, and the car shot away as I threw the release lever over. Not so successful as the soldier in simulating lack of interest in the amorous girl and her companion, I drew from the latter a stare of haughty challenge, and the girl herself turned to look at me through her mask.

She gasped as she did so, and shrank back in alarm. And I knew her then in spite of her mask. She was the favorite of the Heaven Born himself.

"Ngo-Lan!" I exclaimed before I could catch myself. "What—"

At the mention of her name, the soldier's head jerked up quickly, and the girl herself gave a little cry of terror, shrinking against her burly companion. This would mean death for her if it reached the ears of her lord.

And her companion, arrogant in his immunity as a repair man, hesitated not a second. His arm shot out toward the soldier, who was nearer to him than I. There was the flash of a knife blade, and the soldier sagged on his feet, then tumbled over like a sack of potatoes, and before my mind had grasped the danger, he had swept the girl aside and was springing at me.

That I lived for a moment even was due to the devotion of my wife, Wilma, who somewhere in the mountains to the East was standing loyally before the control board of the air ball I carried.

For even as the Han leaped at me, the bundle con-

taining the air ball, which I had placed at my feet, shot diagonally upward, catching the fellow in the middle of his leap, hurling him back against the grilled gate of the elevator shaft, and pinning his lifeless body there.

An instant the girl gazed in speechless horror at what had been her secret lover, then she threw herself at my feet, writhing and shrieking in terror.

At this moment the elevator shot to a sudden stop behind the grill, and prepared for the worst, I faced it, disintegrator pistol raised.

But I lowered the pistol at once, with a sigh of relief. The elevator was empty. For a moment I considered. I dared not leave either of these bodies nor the girl behind in descending the shaft. At any moment other passengers might glide out of the tunnel to take the elevator, and give an alarm.

So I played the beam of the pistol for an instant on the two dead bodies. They vanished, of course, into nothingness, as did part of the station platform. The damage to the platform, however, would not necessarily be interpreted as evidence of a prisoner escaping.

Then I threw open the elevator gate, dragging Ngo-Lan into the car and stifling her hysterical shrieks, pressed the button that caused it to shoot downward. In a few moments I stepped out several thousand feet below, into a shaft that ran toward one of the Valley Gates.

The pistol again became serviceable, this time for the destruction of the elevator, thus blocking any possible pursuit, yet without revealing my flight.

Ngo-Lan fought like a cat, but despite her writhing, scratching and biting, I bound and gagged her with her own clothing, and left her lying in the tunnel while I stepped in a car and shot toward the gate.

As the car glided swiftly along the brilliantly lit but deserted tunnel I conversed again with Wilma through the metallic speaker of the air ball.

"The only obstacle now," I told her, "is the massive gate at the end of the tunnel. The gate-guard, I think, is posted both outside and inside the gate."

"In that case, Tony," she replied, "I will shoot the ball ahead, and blow out the gate. When you hear it bump against the gate, throw yourself flat in the car, for an instant later I will explode it. Then you can rush through the gate into the night. Scout ships are now hovering above, and they will see you with their ultrasopes, though the darkness will leave you invisible to the Hans."

With this the ball shot out of the car and flashed away, down the tunnel ahead of me. I heard a distant metallic thump, and crouched low in the speeding car, clapping my hands to my ears. The heavy detonation which followed, struck me like a blow, and left me gasping for breath. The car staggered like a living thing that had been struck, then gathered speed again and shot forward toward the gaping black hole where the gate had been.

I brought it to a stop at the pile of debris, and climbed through this to freedom and the night. Stumbling I made my way out into the open, and waited.

Behind, and far above me on the mountain peak, the lights of the city gleamed and flashed, while the irri-

descent beams of countless disintegrator ray batteries on surrounding mountain peaks played continuously and nervously, criss-crossing in the sky above it.

Then with a swish, a line dropped out of the sky, and a little seat rested on the ground beside me. I climbed into it, and without further ado was whisked up into the swooper that floated a few hundred feet above me.

A half an hour later I was deposited in a little forest glade where the headquarters of the Wyoming Gang were located, and was greeted with a frantic disregard for decorum by the Deputy Boss of the Wyomings, who rushed upon me like a whirlwind, laughing, crying and whispering endearments all in the same breath, while I squeezed her, Wilma, my wife, until at last she gasped for mercy.

CHAPTER XIV

The Destruction of Lo-Tan

"HOW did you know I had been taken to Lo-Tan as a prisoner?" I asked the little group of Wyoming Bosses who had assembled in Wilma's tent to greet me. "And how does it happen that our gang is away out here in the Rocky Mountains? I had expected, after the fall of Nu-Yok, that you would join the forest ring around Bah-Flo (Buffalo I called it in the Twentieth Century) or the forces beleaguering Bos-Tan."

They explained that my encounter with the Han airship had been followed carefully by several scopemen. They had seen my swooper shoot skyward out of control, and had followed it with their telutronsopes until it had been caught in a gale at a high level, and wafted swiftly westward. Ultraphone warnings had been broadcast, asking Western gangs to rescue me if possible. Few of the gangs West of the Alleghanies, however, had any swoopers, and though I was frequently reported, no attempts could be made to rescue me. Scopemen had reported my capture by the Han ground post, and my probable incarceration in Lo-Tan.

The Rocky Mountain Gangs, in planning their campaign against Lo-Tan, had appealed to the East for help, and Wilma had led the Wyoming veterans westward, though the other eastern gang had divided their aid between the armies before Bah-Flo and Bos-Tan.

The heavy bombardment which I had heard from Lo-Tan, they told me, was merely a test of the enemy's tactics and strength, but it accomplished little other than to develop that the Hans had the mountains and peaks thickly planted with rocket gunners of their own. It was almost impossible to locate these gun posts, for they were well camouflaged from air observation, and widely scattered; nor did they reveal their positions when they went into action as did their ray batteries.

The Hans apparently were abandoning their rays except for air defense. I told what I knew of the Han plans for abandoning the city, and their escape tunnels. On the strength of this, a general council of Gang Bosses was called. This council agreed that immediate action was necessary, for my escape from the city probably would be suspected, and San Lan would be inclined to start the exodus from the city at once.

As a matter of fact, the destruction of the city presented no real problem to us at all. Explosive air balls could be sent against any target under a control that could not be better were their operators riding within them, and with no risk to the operators. When a ball was exploded on its target by the operator, or destroyed by accident, he simply reported the fact to the supply division, and a fresh one was placed on the jump-off, tuned to his contrivis.

To my own Gang, the Wyomings, the Council delegated the destruction of the escape tunnels of the enemy. We had a comfortably located camp in a wooded canyon, some hundred and thirty miles north-east of the city, with about 500 men, most of whom were bayonet-gunners, 350 girls as long-gunners and control-board operators, 91 control boards and about 250 five-foot, inertron protected air balls, of which 200 were of the explosive variety.

I ordered all control boards manned, taking Number One myself, and instructed the others to follow my lead in single file, at the minimum interval of safety, with their projectiles set for signal rather than contact detonation.

In my mind I paid humble tribute to the ingenuity of our engineers as I gently twisted the lever that shot my projectile vertically into the air from the jump-off clearing some half mile away.

The control board before me was a compact contrivance about five feet square. The center of it contained a four-foot viewplate. Whatever view was picked up by the ultronscope "eye" of the air ball was automatically broadcast on an accurate tuning channel to this viewplate by the automatic mechanism of the projectile. In turn my control board broadcast the signals which automatically controlled the movements of the ball.

Above and below the viewplate were the pointers and the swinging needles which indicated the speed and angle of vertical movement, the altimeter, the directional compass, and the horizontal speed and distance indicators.

At my left hand was the lever by which I could set the "eye" for penetrative, normal or varying degrees of telescopic vision, and at my right the universally jointed stick (much like the "joy stick" of the ancient airplanes) with its speed control button on the top, with which the ball was directionally "pointed" and controlled.

The manipulation of these levers I had found, with a very little practice, most instinctive and simple.

So, as I have said, I pointed my projectile straight up and let it shoot to the height of two miles. Then I levelled it off, and shot it at full speed (about 500 miles an hour with no allowance for air currents) in a general southwesterly direction, while I eased my controls until I brought in the telescopic view of Lo-Tan. I centered the picture of the city on the crossed hairlines in the middle of my viewpoint, and watched its image grow.

In about fifteen minutes the "string" of air balls was before the city, and speaking in my ultraphone I gave the order to halt, while I swung the scope control to the penetrative setting and let my "eye" rove slowly

back and forth through the walls of the city, hunting for a spot from which I might get my bearings. At last, after many penetrations, I managed to bring in a view of the head of the shaft at the bottom of which I knew the tunnels were located, and saw that we were none too soon, for all the corridors leading toward this shaft were packed with Hans waiting their turn to descend.

SLOWLY I let my "eye" retreat down one of these corridors until I "pulled it out" through the outer wall of the city. There I held the spot on the crossed hairlines and ordered Number Two Operator to my control board, where I pointed out to her the exact spot where I desired a breach in the wall. Returning to her own board, she withdrew her ball from the "string," and focussing on this spot in the wall, eased her projectile into contact with it and detonated.

The atomic force of the explosion shattered a vast section of the wall, and for the moment I feared I had balked my own game by not having provided a less powerful projectile.

After some fumbling, however, I was able to maneuver my ball through a gap in the debris and find the corridor I was seeking. Down this corridor I sent it at the speed of a Twentieth Century bullet, (that is to say, at about half speed) to spare myself the sight of the slaughter as it cut a swath down the closely packed column of the enemy. If there were any it did not kill, I knew they would be taken care of by the other balls in the string which would follow.

I had to slow it up, however, near the head of the shaft to take my bearings; and a sea of evil faces, contorted with livid terror, looked at me from my viewplate. But not even the terror could conceal the hate in those faces, and there arose in my mind the picture of their long centuries of ruthless cruelty to my race, and the hopelessness of changing the tigerish nature of these Hans. So I steeled myself, and drove the ball again and again into that sea of faces, until I had cleared the station platform of any living enemy, and sent the survivors crushing their way madly along the corridors away from it. There was a blinding flash or two on my viewplate as some Han officer tried his ray pistol on my projectile, but that was all, except that he must have disintegrated many of his fellows, for our balls were sheathed in inerton, and suffered no damage themselves.

Cautioning my unit to follow carefully, I pushed my control lever all the way forward until my "eye" pointed down, and there appeared on my viewplate the smooth cylindrical interior of the shaft, fading down toward the base of the mountain, and like a tiny speck, far, far down, was the car, descending with its last load.

I dropped my ball on it, battering it down to the bottom of the shaft, and with hammer-like blows flattening the wreckage, that I might squeeze the ball out of the shaft at the lower station.

It emerged into the great vaulted excavation, capable of holding a thousand or more persons, from which the various escape tunnels radiated. Down these tunnels the last remnants of a crowd of fugitives were disappearing, while red-coated soldiers guided the traffic

and suppressed disorder with the threat of their spears, and the occasional flourish of a ray pistol.

As I floated my ball out into the middle of the artificial cavern I could see them stagger back in terror. Again the blinding flashes of a few ray pistols, and instantaneous borings of the rays into the walls. The red coats nearest the escape tunnels fled down them in panic. Those whose escape I blocked dropped their weapons and shrank back against the smooth, iridescent green walls.

I marshalled the rest of my string carefully into the cavern, and counted the tunnel entrances, slowly swinging my "eye" around the semicircle of them. There were 26 corridors diverging to the north and west. I decided to send three balls down each, leave 12 in the cavern, then detonate them all at once.

Assigning my operators to their corridors, I ordered intervals of five miles between them, and taking the lead down the first corridor, I ordered "go."

Soon my ball overtook the stream of fugitives, smashing them down despite ray pistols and even rockets that were shot against it. On and on I drove it, time and again battering it through detachments of fleeing Hans, while the distance register on my board climbed to ten, twenty, fifty miles.

Then I called a halt, and suspended my previous orders. I had had no idea that the Hans had bored these tunnels for such distances under the surface of the ground as this. It would be necessary to trace them to their ends and locate their new underground cities in which they expected to establish themselves, and in which many had established themselves by now, no doubt.

Fifty miles of air in these corridors, I thought, ought to prove a pretty good cushion against the shock of detonation in the cavern. So I ordered detonation of the twelve balls we had left behind. As I expected, there was little effect from it so far out in the tunnels.

But from our scopemen who were covering the city from the outside, I learned that the effects of the explosion on the mountain were terrific; far more than I had dared to hope for.

The mountain itself burst asunder in several spots, throwing out thousands of tons of earth and rock. One-half the city itself tore loose and slid downward, lost in the debris of the avalanche of which it was a part. The remainder, wrenched and convulsed like a living thing in agony, cracked, crumbled and split, towers tumbling down and great fissures appearing in its walls. Its power plant and electron machinery went out of commission. Fifteen of its scout ships hovering in the air directly above, robbed of the power broadcast and their repeller beams disappearing, crashed down into the ruins.

But out in the escape tunnels, we continued our explorations, now sure that no warnings could be broadcast to the tunnel exits, and mowed down contingent after contingent of the hated yellow men.

My register showed seventy-five miles before I came to the end of the tunnel, and drove my ball out into a vast underground city of great, brilliantly illuminated corridors, some of them hundreds of feet high and wide. The architectural scheme was one of lace-like

structures of curving lines and of indescribable beauty.

Word had reached us now of the destruction of the city itself, so that no necessity existed for destroying the escape tunnels. In consequence, I ordered the two operators, who were following me, to send their balls out into this underground city, seeking the shaft which the Hans were sure to have as a secret exit to the surface of the earth above.

But at this juncture events of transcending importance interrupted my plans for a thorough exploration of these new subterranean cities of the Hans. I detonated my projectile at once and ordered all of the operators to do so, and to tune in instantly on new ones. That we wrecked most of these new cities I now know, but of course at the time we were in the dark as to how much damage we caused, since our viewpoints naturally went dead when we detonated our projectiles.

CHAPTER XV

The Counter-Attack

THE news which caused me to change my plans was grave enough. As I have explained, the American lines lay roughly to the east and the south of the city in the mountains. My own Gang held the northern flank of the east line. To the south of us was the Colorado Union, a force of 5,000 men and about 2,000 girls recruited from about fifteen Gangs. They were a splendid organization, well disciplined and equipped. Their posts, rather widely distributed, occupied the mountain tops and other points of advantage to a distance of about a hundred and fifty miles to the south. There the line turned east, and was held by the Gangs which had come up from the south. Now, simultaneously with the reports from my scouts that a large Han land force was working its way down on us from the north, and threatening to outflank us, came word from Jim Hallwell, Big Boss of the Colorado Union and the commander in chief of our army, that another large Han force was to the southwest of our western flank. And in addition, it seemed, most of the Han military forces at Lo-Tan had been moved out of the city and advanced toward our lines before our air-ball attack.

The situation would not have been in the least alarming if the Hans had had no better arms to fight with than their disintegrator rays, which naturally revealed the locations of their generators the second the visible beams went into play, and their airships, which we had learned how to bring down, first from the air, and now from the ground, through ultrono-controlled projectiles.

But the Hans had learned their lesson from us by this time. Their electrono-chemists had devised atomic projectiles, rocket-propelled, very much like our own, which could be launched in a terrific barrage without revealing the locations of their batteries, and they had equipped their infantry with rocket guns not dissimilar to ours. This division of their army had been expanded by general conscription. So far as ordnance was concerned, we had little advantage over them; although tactically we were still far superior, for our jumping belts enabled our men and girls to scale otherwise inaccessible heights, conceal themselves readily in the upper

branches of the giant trees, and gave them a general all around mobility, the enemy could not hope to equal.

We had the advantage too, in our ultronophones and scopes, in a field of energy which the Hans could not penetrate, while we could cut in on their electrono, or (as I would have called it in the Twentieth Century) radio broadcasts.

Later reports showed that there were no less than 10,000 Hans in the force to our north, which evidently was equipped with a portable power broadcast, sufficient for communication purposes and the local operation of small scoutships, painted a green which made them difficult to distinguish against the mountain and forest backgrounds. These ships just skimmed the surface of the terrain, hardly ever outlining themselves against the sky. Moreover, the Han commanders wisely had refrained from massing their forces. They had deployed over a very wide and deep front, in small units, well scattered, which were driving down the parallel valleys and canyons like spearheads. Their communications were working well too, for our scouts reported their advance as well restrained, and maintaining a perfect front as between valley and valley, with a secondary line of heavy batteries, moved by small airships from peak to peak, following along the ridges somewhat behind the valley forces.

Hallwell had determined to withdraw our southern wing, pivoting it back to face the outflanking Han force on that side, which had already worked its way well down in back of our line.

In the ultronophone council which we held at once, each Boss tuning in on Hallwell's band, though remaining with his unit, Wilma and I pleaded for a vigorous attack rather than a defensive maneuver. Our suggestion was to divide the American forces into three divisions, with all the swoopers forming a special reserve, and to advance with a rush on the three Han forces behind a rolling barrage.

But the best we could do was to secure permission to make such an attack with our Wyomings, if we wished, to serve as a diversion while the lines were reforming. And two of the southern Gangs on the west flank, which were eager to get at the enemy, received the same permission.

The rest of the army fumed at the caution of the council, but it spoke well for their discipline that they did not take things in their own hands, for in the eyes of these forest men who had been hounded for centuries, the chance to spring at the throats of the Hans outweighed all other considerations.

So, as the council signed off, Wilma and I turned to the eager faces that surrounded us, and issued our orders.

IN a moment the air was filled with leaping figures as the men and girls shot away over the tree tops and up the mountain sides in the deployment movement.

A group of our engineers threw themselves headlong toward a cave across the valley, where they had rigged out a powerful electrono plant operating from atomic energy. And a few moments later the little portable receiver, the Intelligence Boss used to pick up the enemy

messages, began to emit such ear-splitting squeals and howls that he shut it off. Our heterodyne or "radio-scrambling" broadcast had gone into operation, emitting impulses of constantly varying wavelength over the full broadcast range and heterodyning the Han communications into futility.

In a little while our scouts came leaping down the valley from the north, and our air balls now were hovering above the Han lines, operators at the control boards near-by painstakingly picking up the pictures of the Han squads struggling down the valleys with their comparatively clumsy weapons.

As fast as the air-ball scopes picked out these squads, their operators, each of whom was in ultraphone communication with a girl long-gunner at some spot in our line, would inform her of the location of the enemy unit, and the latter, after a bit of mathematical calculation, would send a rocket into the air which would come roaring down on, or very near that unit, and wipe it out.

But for all of that, the number of the Han squads was too much for us. And for every squad we destroyed, fifty others continued their advance.

And though the lines were still several miles apart, in most places, and in some cases with mountain ridges intervening, the Han fire control began to sense the general location of our posts, and things became more serious as their rockets too began to hiss down and explode here and there in our lines, not infrequently killing or maiming one or more of our girls.

The men, our bayonet-gunners, had not as yet suffered, for they were well in advance of the girls, under strict orders to shoot no rockets nor in any way reveal their positions; so the Han rockets were going over their heads.

The Hans in the valleys now were shooting diagonal barrages up the slopes toward the ridges, where they suspected we would be most strongly posted, thus making a cross-fire up the two sides of a ridge, while their heavy batteries, somewhat in the rear, shot straight along the tops of the ridges. But their valley forces were getting out of alignment a bit by now, owing to our heterodyne operations.

I ordered our swoopers, of which we had five, to sweep along above these ridges and destroy the Han batteries.

Up in the higher levels where they were located, the Hans had little cover. A few of their small rep-ray ships rose to meet our swoopers, but were battered down. One swooper they brought to earth with a disintegrator ray beam, by creating a vacuum beneath it, but they did it no serious damage, for its fall was a light one. Subsequently it did tremendous damage, cleaning off an entire ridge.

Another swooper ran into a catastrophe that had one chance in a million of occurring. It hit a heavy Han rocket nose to nose. Inertion sheathing and all, it was blown into powder.

But the others accomplished their jobs excellently. Small, two-man ships, streaking straight at the Hans at between 600 and 700 miles an hour, they could not be hit except by sheer amazing luck, and they showered

their tiny but powerful bombs everywhere as they went.

At the same instant I ordered the girls to cease sharp-shooting, and lay their barrages down in the valleys, with their long-guns set for maximum automatic advance, and to feed the reservoirs as fast as possible, while the bayonet-gunners leaped along close behind this barrage.

Then, with a Twentieth Century urge to see with my own eyes rather than through a viewplate, and to take part in the action, I turned command over to Wilma and leaped away, fifty feet a jump, up the valley, toward the distant flashes and rolling thunder.

CHAPTER XVI

Victory!

I HAD gone five miles, and had paused for a moment, half way up the slope of the valley to get my bearings, when a figure came hurtling through the air from behind, and landed lightly at my side. It was Wilma.

"I put Bill Hearn in command and followed Tony. I won't let you go into that alone. If you die, I do, too. Now don't argue, dear. I'm determined."

So together we leaped northward again toward the battle. And after a bit we pulled up close behind the barrage.

Great, blinding flashes, like a continuous wall of gigantic fireworks, receded up the valley ahead of us, sweeping ahead of it a seething, tossing mass of debris that seemed composed of all nature, tons of earth, rocks and trees. Ever and anon vast sections of the mountain sides would loosen and slide into the valley.

And, leaping close behind this barrage, with a reckless skill and courage that amazed me, our bayonet gunners appeared in a continuous series of flashing pictures, outlined in midleap against the wall of fire.

I would not have believed it possible for such a barrage to pass over any of the enemy and leave them unscathed. But it did. For the Hans, operating small disintegrator beams from local or field broadcasts, frantically bored deep, slanting holes in the earth as the fiery tides of explosions rolled up the valleys toward them, and into these probably half of their units were able to throw themselves and escape destruction.

But dazed and staggering they came forth again only to meet death from the terrible, ripping, slashing, cleaving weapons in the hands of our leaping bayonet gunners.

Thrust! Cut! Crunch! Slice Thrust! Up and down with vicious, tireless, flashing speed, swung the bayonets and ax-bladed butts of the American gunners as they leaped and dodged, ever forward, toward new opponents.

Weakly and ineffectually the red-coated Han soldiery thrust at them with spears, flailing with their short-swords and knives, or whipping about their ray pistols. The forest men were too powerful, too fast in their remorselessly efficient movement.

With a shout of unholy joy, I gripped a bayonet-gun from the hands of a gunner whose leg had been whisked out of existence beneath him by a pistol ray,

and leaped forward into the fight, launching myself at a red-coated officer who was just stepping out of a "worm hole."

Like a shriek of the Valkyrie, Wilma's battle cry rang in my ear as she, too, shot herself like a rocket at a red-coated figure.

I thrust with every ounce of my strength. The Han officer, grinning wickedly as he tried to raise the muzzle of his pistol, threw himself backward as my bayonet ripped the air under his nose. But his grin turned instantly to sickened surprise as the up-cleaving ax-blade on the butt of my weapon caught him in the groin, half bisecting him.

And from the corner of my eye I saw Wilma bury her bayonet in her opponent, screaming in ecstatic joy.

And so, in a matter of seconds, we found ourselves in the front rank, thrusting, cutting, dodging, leaping along behind that blinding and deafening barrage in a veritable whirlwind of fury, until it seemed to me that we were exulting in a consciousness of excelling even that tide of destruction in our merciless efficiency.

At last we became aware, in but a vague sort of way at first, that no more red-coats were rising up out of the ground to go down again before our whirling, swinging weapons. Gradually we paused, looking about in wonder. Then the barrage ceased, and the sudden absence of the deafening roll, and the wall of light, in themselves, deafened and blinded us.

I leaped weakly toward the spot where hazily I spied Wilma, now drooping and swaying on her feet, supported as she was by her jumping belt, and caught her in my arms, just as she was sinking gently to the ground.

All around us the weary warriors, crimsoned now with the blood of the enemy, were sinking to the ground in exhaustion. And as I, too, sank down, clutching in my arms the unconscious form of my warrior wife, I began to hear, through my helmet phones, the exultant report of headquarters.

Our attack had swept straight through the enemy's sector, completely annihilating everything except a few hundred of his troops on either flank. And these, in panic and terror, had scattered wildly in flight. We had wiped out a force more than ten times our own number. The right flank of the American army was saved. And already the Colorado Union, from behind us, was leaping around in a great circling movement, closing in on the Han force that was advancing from the ruins of Lo-Tan.

Far away, to the southwest, the Southern Gangs, reinforced in the end by the bulk of our left wing, had struck straight at the enveloping Han force shattering it like a thunderbolt, and at present were busily hunting down and destroying its scattered remnants.

But before the Colorado Union could complete the destruction of the central division of the enemy, the despairing Hans saved them the trouble. Company after company of them, knowing no escape was possible, lined up in the forest glades and valleys, while their officers swept them out of existence by the hundreds with their ray pistols, which they then turned on themselves.

And so the fall of Lo-Tan was accomplished. Somewhere in the seething activities of those few days, San Lan, the "Heaven Born" Emperor of the Hans in America, perished, for he was heard of never again, and the unified action of the Hans vanished with him, though it was several years before one by one their remaining cities were destroyed and their populations hunted down, thus completing the reclamation of America and inaugurating the most glorious and noble era of scientific civilization in the history of the American race.

AS I look back on those emotional and violent years from my present vantage point of declining existence in an age of peace and good will toward all mankind, they do seem savage and repellent.

Then there flashes into my memory the picture of Wilma (now long since gone to her rest) as, screaming in an utter abandon of merciless fury, she threw herself recklessly, exultantly into the thick of that wild, relentless slaughter; and my mind can find nothing savage nor repellent about her.

If I, product of the relatively peaceful Twentieth Century, was so completely carried away by the fury of that war, intensified by centuries of unspeakable cruelty on the part of the yellow men who were mentally gods and morally beasts, shall I be shocked at the "bloodthirstiness" of a mate who was, after all, but a normal girl of that day, and who, girl as she was, never for a moment faltered in the high courage with which she threw herself into that combat, responding to the passionate urge for freedom in her blood that not five centuries of inhuman persecution could subdue?

Had the Hans been raging tigers, or slimy, loathesome reptiles, would we have spared them? And when in their centuries of degradation they had destroyed the souls within themselves, were they in any way superior to tigers or snakes? To have extended mercy would have been suicide.

In the years that followed, Wilma and I travelled nearly every nation on the earth which had succeeded in throwing off the Han domination, spurred on by our success in America, and I never knew her to show to the men or women of any race anything but the utmost of sympathetic courtesy and consideration, whether they were the noble brown-skinned Caucasians of India, the sturdy Balkanites of Southern Europe, or the simple, spiritual Blacks of Africa, today one of the leading races of the world, although in the Twentieth Century we regarded them as inferior. This charity and gentleness of hers did not fail even in our contacts with the non-Han Mongolians of Japan and the coast provinces of China.

But that monstrosity among the races of men which originated as a hybrid somewhere in the dark fastnesses of interior Asia, and spread itself like an inhuman yellow blight over the face of the globe—for that race, like all of us, she felt nothing but horror and the irresistible urge to extermination.

Latterly, our historians and anthropologists find much support for the theory that the Hans sprang

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from a genus of human-like creatures that may have arrived on this earth with a small planet (or large meteor) which is known to have crashed in interior Asia late in the Twentieth Century, causing certain permanent changes in the earth's orbit and climate.

Geological convulsions blocked this section off from the rest of the world for many years. And it is a historical fact that Chinese scientists, driving their explorations into it at a somewhat later period, met the first wave of the on-coming Hans.

The theory is that these creatures (and certain queer skeletons have been found in the "Asiatic Bowl") with a mental superdevelopment, but a vacuum in place of that intangible something we call a soul, mated forcibly with the Tibetans, thereby strengthening their physical structure to almost the human normal, adapting themselves to earthly speech and habits, and in some strange manner intensifying even further their mental powers.

Or, to put it the other way around. These Tibetans, through the injection of this unearthly blood, deteriorated slightly physically, lost the "soul" parts of their nature entirely, and developed abnormally efficient intellects.

However, through the centuries that followed, as

the Hans spread over the face of the earth, this unearthly strain in them not only became more dilute, but lost its potency; and in the end, the poison of it submerged the power of it, and earth's mankind came again into possession of its inheritance.

How all this may be, I do not know. It is merely a hypothesis over which the learned men of to-day quarrel.

But I do know that there was something inhuman about these Hans. And I had many months of intimate contact with them, and with their Emperor in America. I can vouch for the fact that even in his most friendly and human moments, there was an inhumanity, or perhaps "unhumanity" about him that aroused in me that urge to kill.

But whether or not there was in these people blood from outside this planet, the fact remains that they have been exterminated, that a truly human civilization reigns once more—and that I am now a very tired old man, waiting with no regrets for the call which will take me to another existence.

There, it is my hope and my conviction that my courageous mate of those bloody days waits for me with loving arms.

THE END.



In this department we shall discuss, every month, topics of interest to readers. The editors invite correspondence on all subjects directly or indirectly related to the stories appearing in this magazine. In case a special personal answer is required, a nominal fee of 25c to cover time and postage is required.

AN ELABORATE CRITICISM AND IN PARTS A VERY SEVERE ONE

Editor, AMAZING STORIES:

It is not very often that I say anything about AMAZING STORIES; I suppose the reason is that it is satisfactory in many ways, though not all.

And now for the September issue. In the first place I notice that the cover is at least human (though of course it isn't, after all); at any rate nobody would mind showing it to old aunt Agatha or old uncle Zeb. To tell the truth I was surprised. I actually mean it, surprised. I didn't believe that I had Amazing Stories. Many more covers like this and you'll make hundreds of friends that have been hitherto frightened away by the frightful fancies of Paul. Now perhaps I don't mean that exactly. Paul is all right as far as he doesn't draw a human being from the rear. When he does that, the faces are frightful. And then, sometimes the faces are, anyway. Paul may be competent at drawing machinery, but when it comes to humans (as a rule) they're not humans, but monstrosities.

Now, somebody, I forget who, said that the cover of the April issue was finer; I may add—and how! So you see Paul's all right as long as he keeps away from animate objects—and I mean that, i.e., except in certain cases. It's something that's hard to describe. On certain occasions I have considered this artist very fine, and then—

But this R. E. Lawlor: his drawing of "The Days to Come" by Wells was fine, as well as the one for "Vandals From The Moon." The latter story, by the way, was one that I never finished; in my opinion it was too much like "The War of the Worlds," but of course others may

have enjoyed it immensely. At any rate, Lawlor's drawing for it was wonderful.

But there seems to be something wrong with all these artists; sometimes they forget they're supposed to be artists and perpetrate the most horrible things—yes, things!

Lawlor's drawing of "The Head" in the August issue is a perfect nightmare. In fact, both aunt Agatha and uncle Zeb would have been disintegrated by it. If any human faces ever looked like any of those in the picture, then I claim no kin to the human race; to them, a gorilla is a handsome creature—one to be aped by every one (yes, that was intended!) I'm glad I never dream—at least I don't remember any—for if I did I might be compelled to have a squad of detectives around. The only thing I can say is that if you cherish your magazine, don't let this (or the other either, for that matter) artist ruin it. These cheap, lurid drawings are sapping the life out of your veins; so don't tell me, that while I have a perfect right to my opinion, there are others who think Lawlor and Paul rank with Leonardo da Vinci; I already know that.

And now another brickbat (this one dipped in sulfuric acid). This little project has three parts: 1. You'd better change the name of the magazine before you frighten away the timid folk who would love to read it, but dare not because of the name.

2. Please give us a magazine put out like the *Literary Digest*, or something like it. At any rate, give us the good paper—AMAZING STORIES is old enough for that, surely. I don't see where it had

improved since the first issue (that is: paper, binding, etc.).

3. The emblem is rotten. It expresses the idea, but entirely too plainly. In my opinion, B. Wheelock has the best one. His (Hers) has a strange indescribable esthetic touch about it. Somehow it said: *Future Achievement*.

Now I know nothing will come of this bit of criticism; I don't expect anything. But I would especially like to see something in the line of the second one. That idea isn't original; it was mentioned long ago in your discussion column, but you didn't even notice it (as far as results were concerned).

I started out by saying that I would (notice the conceit) that I would criticize the September issue. I'll change that: I will try. Ah! that's better. Now, after discussing everything under the sun, insulting the artists and the editor and the magazine in general, I'll continue until my greatest enemy, the trash basket, has tried out poison gas.

As I said, the cover of the September issue is the best yet (if we except Paul's magnificent cover for April); but, add by way of cruelty, that the emblem is rotten; but that's your affair; it may be beautiful to you. And anyway, I don't have to wear it.

Mr. Gernsback's editorial was as usual fine and instructive. Has he ever gathered them into book form? That would certainly be a book of gems; why not suggest it to him?

"The Ambassador From Mars" was right good, but why must all scientific stories of lost races and the like end tragically? When there's a pur-

(Continued on page 1138)

"I Found the Short Cut to Success in Radio

through this amazing home laboratory method!"



The only radio training sponsored by RCA . . . General Electric, Westinghouse . . . FREE 50-page book tells all about it. Mail coupon.

By Frank Halloran

I GOT hungry to get into Radio when I learned about the big money it was bringing my next door neighbor.

He was only twenty-eight years old, but his income was over four times as much as I was getting. He owned a fine car, dressed in expensive clothes, took week-ends off to go hunting and fishing, and was one of the most popular fellows in town.

"Charlie," I asked him one day, "how did you become a radio expert?"

"A cinch," he smiled. "I took it up in my spare time at home."

"What?" I asked in surprise, "you actually took a radio course by mail?"

"No," he shot back. "Not just a mail order course, but the only technical home-laboratory training conducted under the auspices of RCA, Westinghouse and General Electric! Believe me, these 'big-league' organizations not only know what's what in radio, but they know how to teach it!"

A Great Piece of Luck

Taking Charlie's advice was the luckiest thing I've ever done. It's bringing me more money in a week than I've often earned in a month!

I never dreamed that learning radio at home was so easy and so fascinating. From

the very first lesson to the last I was thrilled! Each subject was explained in simple word and picture form . . . and written in such an interesting style that I was carried along like a novel!

I didn't know the first thing about radio when I started, yet before many months were over I was able to solve many of the problems which now help me command big money. The lessons took me step by step through trouble-finding and repairing . . . through ship and shore and broadcasting apparatus operation and construction . . . through photoradiograms, television and beam transmission . . . through radio salesmanship, store operation and executive work.

Success—In Spare Time!

I didn't have to give up my regular job. I learned at home during my spare time. And I actually learned by doing! With the course, I received an outlay of the finest standard apparatus with which I was able to build radio circuits and sets of almost every description . . . yet this expensive apparatus cost me absolutely nothing extra!

Even before I had completed the course I was able to earn good money doing odd radio jobs. And it wasn't long after that I was able to give up my regular work and branch out for myself as a full-fledged expert in work that is fun and extremely profitable!

Today, my income is more than doubled . . . and I've only just started! I'm certainly happy that I found this short cut to success!

Read This Thrilling FREE Book

Frank Halloran's wonderful success is just another typical example of the success which the Radio Institute is bringing to hundreds of men everywhere through its wonderful Home-laboratory training . . . the only official radio training based on the inside knowledge of radio developed in the great experimental laboratories of RCA, General Electric and Westinghouse!

There is an amazing opportunity for you in Radio. Manufacturers, dealers, broadcasting stations, ships . . . all are calling for trained radio experts. The pay is big—the opportunities are limitless—the work is thrilling! Find out all about it. The Institute has prepared an interesting, illustrated booklet telling you all you want to know about this vast industry and about the remarkable home study-course that can fit you for a brilliant radio career. Just mail the coupon below and claim your copy of this valuable booklet . . . it's absolutely free! Radio Institute of America, Dept. M-2, 326 Broadway, New York



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ANTENNA and GROUND

Combined in one convenient Unit

A wonderful thing has happened in radio! Convenience never before dreamed of! Clearer, sweeter-toned reception! Radio pleasure with less interruption! These things are brought to you by the amazing, tested, approved, EARTHANTENNA.

Many set owners have come to realize the importance of using a dependable antenna, also the value of perfect grounding in getting good reception. Now science has gone a step further; it says that the LOCATION of the antenna is an equally important factor in getting best results. Because the radio wave goes right into the earth—where obviously there is less atmospheric disturbance and interference—it is claimed the logical place for the antenna should be the EARTH, not the air. This important conclusion allowed Radio Engineers to work out the EARTHANTENNA.

Reduces Static— Gets Clearer, Sweeter Tone

Have you ever listened to reception that almost took your breath away with its faultless reproduction, its pure melodious tone? And then gone home and compared its haunting beauty to YOUR receiver's often unsatisfactory, static-ridden performance? Probably nine out of ten set owners who formerly thought they were getting "pretty good" reception have had this experience.

They accepted the shrieks, whistles, knocking and howls due to atmospheric conditions—the weak, faulty results of sagging, broken, or soot-laden aerial wires—the interference of other aerials or power line noises—the fading often caused by corrosion or imperfect contact in an unscientific ground—all as necessary evils.

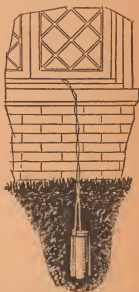
Progressive radio refused to stop there. The new scientific, successful EARTHANTENNA is designed to give you clearer, better, more dependable reception—and it costs no more than the old inefficient aerial—in fact less than many.

EARTHANTENNA is so easy to install that soon people will wonder how they ever put up with the old, dangerous, slow methods. You simply dig a small hole only two feet below the surface of the ground, drop the EARTHANTENNA into it and attach the lead-in wires to your set. Now you are ready to listen to earth-clarified, sweeter-toned ground wave reception. You never need to touch the EARTHANTENNA again.

Shielded Antenna Gets Better Reception

The antenna is insulated or "shielded" against electro-static disturbances as are the most advanced, expensive receivers and their various parts. Science declares that the earth itself "shorts" the electro-static capacity before it reaches the Antenna. This acts as another shield.

The ground element is constructed of copper, undisputed as the most effective material for obtaining a perfect ground connection. This section of the unit is separated from the Antenna by the insulation which shields the Antenna. So in the EARTHANTENNA you have a scientific ground and an antenna of modern shielded construction combined in one compact unit. You can test it yourself right now at our risk. Hear the wonderful results!



Test EARTHANTENNA at OUR Risk

Let EARTHANTENNA prove its own value without your risking one cent. Don't remove your old aerial and ground until you've compared the old and modern methods and hear the vast improvement with the new. If possible pick a time when static is bad. Then if you are not convinced that EARTHANTENNA is the greatest discovery you've ever found for your radio—if you are not enthused over the improvement—you don't pay us a cent. The thrilling details of this important development—illustrated—will be sent immediately on receipt of this coupon. Mail it NOW!

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What These Have Done YOU CAN DO!

"Since I have been studying with your school I have been appointed chemist for the Scranton Coal Co., testing all the coal and ash by proximate analysis."
—Morris Couzens.

"I also have some news for you. I have been made assistant chemist for the concern I am working for."
—A. G. Delwarte.

"I am now cleaner and dyer for the above named company. My salary is almost double what it was when I started the course."
—E. H. Lasater.

"Your training has opened things to me that otherwise I would probably be years in acquiring. I now enjoy comforts that before I had to do without. It enabled me to have a wonderful little home, a fine laboratory of my own, and gave me a respected position in one of the foremost textile concerns in the country."
—J. J. Kelly.

"If it weren't for your course I wouldn't have the job I've got now."
—George Daynes.

"Since beginning your course of study I have received an increase in my pay check, and as I progress my work becomes lighter through a better understanding."
—M. G. Cole.

"I am mighty glad I took this course. My salary has been increased several times, and different industrial plants are coming to me for a little advice on different things, netting me a fair side income."
—M. E. Van Sickle.

FORTUNES HAVE BEEN MADE THROUGH CHEMISTRY

Alfred Nobel, the Swedish chemist who invented dynamite, made so many millions that the income alone from his bequests provides five \$20,000 prizes every year for the advancement of science and peace. C. M. Hall, the chemist who discovered how to manufacture aluminum, made millions through this discovery. F. G. Cottrell, who devised a valuable process for recovering the waste from the blast, James Gayley, who showed how to save enormous losses in steel manufacture, L. H. Baekeland, who invented Bakelite—these are only a few of the men to whom fortunes have come through their chemical achievements.

NOW IS THE TIME TO STUDY CHEMISTRY

Never before has the world seen such splendid opportunities for chemists as exist today. In factories, mills, laboratories, electrical shops, industrial plants of all kinds, chemistry plays a vital part in the continuation and expansion of the business. In every branch of human endeavor the need for chemists has arisen. Those who have the foresight and ambition to learn chemistry now will have the added advantages and greater opportunities afforded while the chemical field is growing and expanding.

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We give to every student, without additional charge, his chemical equipment, including fifty-two pieces of laboratory apparatus and supplies, and fifty-two different chemicals and reagents. The fitted heavy wooden box serves not only as a case for the outfit, but also as a laboratory accessory for performing countless experiments. Full particulars about this special feature of our course are contained in our free book, "Opportunities for Chemists."

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You get expert instruction, learn from a world-famous player and teacher, Prof. Walter Kaula. He reveals to you the secrets of this fascinating instrument.

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You get 82 complete printed lessons. Nothing is omitted. Pictures explain every move. You don't need to know the first thing about music when you begin—you can positively learn to play by your plain, step-by-step method. You are sure to learn it. What we can do for others we can do for you. 61,000 successful students. This record speaks for itself.

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Once you learn these four simple motions you can play any popular music, whether old-time music, native Hawaiian or real jazz—separately or with accompaniment. You'll never be lonely after you learn to play this beautiful Hawaiian guitar.

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With Genuine Seal Grain Fabrikoid Cover and Complete Playing Outfit

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Study in spare time—in absolute privacy at home. Our method is so simple you begin a place your first lesson. In half an hour you can play it.

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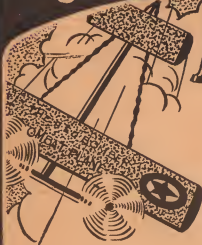
We make it easy for you. Start with small payments—just pay the first lesson. It comes to only a few cents per lesson. You can pay the rest of the course—we furnish everything else.

Send 1 Dollar Today. Value, COURSES: 1 Year, 1 Year, 2 Year, 3 Year, 4 Year, 5 Year, 6 Year, 7 Year, 8 Year, 9 Year, 10 Year, 11 Year, 12 Year, 13 Year, 14 Year, 15 Year, 16 Year, 17 Year, 18 Year, 19 Year, 20 Year, 21 Year, 22 Year, 23 Year, 24 Year, 25 Year, 26 Year, 27 Year, 28 Year, 29 Year, 30 Year, 31 Year, 32 Year, 33 Year, 34 Year, 35 Year, 36 Year, 37 Year, 38 Year, 39 Year, 40 Year, 41 Year, 42 Year, 43 Year, 44 Year, 45 Year, 46 Year, 47 Year, 48 Year, 49 Year, 50 Year, 51 Year, 52 Year, 53 Year, 54 Year, 55 Year, 56 Year, 57 Year, 58 Year, 59 Year, 60 Year, 61 Year, 62 Year, 63 Year, 64 Year, 65 Year, 66 Year, 67 Year, 68 Year, 69 Year, 70 Year, 71 Year, 72 Year, 73 Year, 74 Year, 75 Year, 76 Year, 77 Year, 78 Year, 79 Year, 80 Year, 81 Year, 82 Year, 83 Year, 84 Year, 85 Year, 86 Year, 87 Year, 88 Year, 89 Year, 90 Year, 91 Year, 92 Year, 93 Year, 94 Year, 95 Year, 96 Year, 97 Year, 98 Year, 99 Year, 100 Year, 101 Year, 102 Year, 103 Year, 104 Year, 105 Year, 106 Year, 107 Year, 108 Year, 109 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We feel that the publication of our QUARTERLY, born of a compromise solution to monthly and twice a month publication, takes care of the readers, who desire more frequent issues.

Your letter certainly is a very good one.—
Editors.)

THE MASS OF COMETS—THEIR GRAVITATIONAL ACTION ON THE EARTH AND PLANETS

Editor, AMAZING STORIES:

Having read your magazine regularly since its early infancy, and having gained many valuable ideas from it, I feel that I must send you a few words of thanks and appreciation for the many interesting hours of reading you have given me. The stories are all well balanced and well told and in every issue there is always one story that is worth in itself more than the price of the magazine. Certainly this cannot be said of very many magazines on our newsstands today.

For many years astronomy has been my hobby, and I am naturally most interested in the stories you publish about that line. In this month's (August) issue, I note that Mr. Bittling of Elkins Park, Pa., is writing of "Ten Million Miles-Sunward" in the "Discussions" columns, and he says he could find no flaw in the story. Possibly the subject was covered quite thoroughly by Professor Luyten, but I have wondered many times since the publication of the story, why no mention was made of the fact that the mass of comets is so small that the effect on any planet is negligible. If I am wrong please correct me, but it is not true that the comet is usually the object deflected from its course, and not the planet?

I am fortunate in possessing a four and a half inch. Mory telescope and a little over a year ago I watched with great interest the progress of Encke's comet through our skies. It gave me quite a thrill to be able to see stars quite clearly through the comet as it passed between the earth and them. Surely its mass would not be sufficient to pull the earth in any noticeable way from its orbit? Probably I am wrong in my statement as to a possible flaw, but no one seems to have mentioned its existence, so I would like to know.

Excuse the length of this letter. I never appear to know when to stop when writing on astronomy. Perhaps I should add that in the story I have been referring to, the author says the comet passed 18,000,000 miles from Earth. In 1770, according to Flammarion in "Popular Astronomy," the comet of Lexell passed 150,000 miles from earth, yet no ill effect was felt, though the earth passed through the comet's tail.

VERNE DENNEY,
219½ E. Grand Avenue,
Panca City, Okla.

(The point you make about the mass of comets is a very good one. They certainly are very tenuous, but if there is any matter in them it will affect other bodies. But comets in general are rather mysterious visitants of our system, and the curves which they follow would seem to be absolutely non-recurrent, and yet comet after comet comes back to us after years of absence in many cases. But what has it done with itself. And how, if it possesses a hyperbolic path, can it ever come back to us? The hyperbola is an open curve and cannot bring the comet back if it follows it? In other words, comets give us considerable to think about outside of the question of their mass.

On the other hand, there are comets and comets. Most of them undoubtedly have a rather small mass, but it is quite possible that some of them have quite a considerable mass, that is, at least as far as the head is concerned. While it is true that it is always easy to look through its tail, which seems to be mostly composed of gas, the head of the comet is possibly solid and dust-like, and while there is probably never enough mass to pull the earth out of its orbit or even affect it to a perceptible extent, a collision between the earth and the comet would possibly not be very pleasant. Astronomers have been able to calculate quite accurately the mass and weight of comets, at least as far as their head is concerned, and in most cases, the amount was quite small as compared with the mass and weight of the earth.—Editor.)

MR. PAUL'S COVER ILLUSTRATIONS; THE "FEMININE READER"; "THE MENACE OF MARS" CRITICIZED

Editor, AMAZING STORIES:

I have just finished reading the October issue of *AMAZING STORIES*. I notice that Mrs. Silberberg wants you to "tone Mr. Paul down"—please don't, I like the pictures and I'm sure that others do, too. I used to wonder, too, if I were the only "feminine reader"—three have been discovered,—are there any others? I am a constant reader of *AMAZING STORIES* and of the *QUARTERLY*, and I enjoy both immensely. I hope that you do not decide to use the same cover design each month, the cover illustrations are so interesting; besides, we would miss Mr. Paul's illustrations.

Now I have a question to ask. In "The Menace of Mars," (Oct., \$84-585) the author has Antares appear over the western tree-tops just after sundown, in the month of April. Did Antares give a special performance? Otherwise such an appearance would be unusual to say the least. Antares would be in the southwest just after sundown in September and October. On April 17 (the date given in the story) the constellations visible in the southwest are: Gemini, the Pleiades, Cassio Minor, Canis Major, Taurus, and Orion. The following stars would appear in approximately this order: Sirius, Procyon, Betelgeuse, Rigel, Castor, Pollux, Aldebaran and Bellatrix.

Another comment on the same story—(Page 586) "the counter-gravitational pull of the stars and planets" would be exerted on scales as well as on persons and the result would be the same as usual. I mean that a person would weigh the same as before, by the scales.

I think that the "Skyrak of Space" was very good, although the third instalment became somewhat too "slushy."

I also wish that there were more stories in each issue.

I forgot to add when commenting on "The Menace of Mars" that if the colonies were situated at the poles, it would be impossible to travel from one to another in 24 hours at 400 miles per hour.

MISS RUTH CHADBOURNE
132 Twenty-first St.,
Bottle Creek, Michigan.

(We are glad you do not want Paul toned down. We sometimes think that we would like to tone him up. He has many admirers among the readers. We have written to the author to know why Antares behaves so egregiously and she writes us that there was a mistake in her astronomy. If a person was subject to anti-gravitational pull, its effect would be shown by a spring balance and not by one using weights.—EDITOR.)

THE DOPPLER FORMULA AND THE EFFECT OF TRAVELING AGAINST A BEAM OF LIGHT AS IT COMES FROM A STAR

Editor, AMAZING STORIES:

I should like to contribute to the discussions among with regards to interstellar traveling at speeds greater than that of light.

Using the Doppler formula, we can deduce the following:

Red light would appear red, but coming in the opposite direction to ours. Also, rays having a direction opposite to ours would have an apparent frequency three times their real frequency.

So far so good, but now what would happen if we went at twice the velocity of light in a direction directly opposite to that of a beam of violet rays coming say from some star? Their frequency would be trebled, i.e. they would no longer be violet rays, to us, but would go far beyond into the realms of ultra-violet rays (almost actinic rays) and we would get "sunburnt" if we exposed our skin to them. But it is well known that violet rays do not burn the skin, and after all they are violet rays: Are they not?

Personally I believe Einstein is right although I am far, very far, from understanding what he proves and how he proves it, but I accept it, and until such time as I may prove that he is wrong I would not simply say that he is wrong, as many are apt to do.

Before I close, I would like to ask your opinion on a certain thing.

If a new-born child were deprived of eyesight, hearing, smell, taste and sense of touch, would that child live? Of course he would not know that he was alive, but would his instincts of self preservation act under these handicaps? It is a question that has puzzled me for a long time and I very much wish that you would publish it in the discussions column.

R. A. EADES,
11 Holland Road,
London, W. 14

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F. A. HARRIS, Dept. 505, 610 N. Dearborn St., Chicago, Ill.



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(If a luminous body only emitted ether waves comprised within the rays of the spectrum, we could easily see all their light being blotted out, as it were, under the Doppler law, if a body approached them in high velocity. But they emit any number of longer ether waves, too long to affect the retina and these would be brought into the spectrum by motion towards the light. This fact covers what you and others have referred to in considering the fact of the approach of high velocity to or from the stars.

A new-born child, such as you describe, would not be much worse off than Helen Keller, who, though dumb, deaf, and blind, has attained a wonderful intellectual development, showing what the human mind can do.—EDITOR)

OUR COVER ILLUSTRATIONS TOO "LURID"; A CHANGE OF NAME SUGGESTED— THE IMPOSSIBLE IN STORIES

Editor, AMAZING STORIES:

Having been a fairly regular reader of AMAZING STORIES, both the monthly and the QUARTERLY, ever since the first issue, I think it is time that I should let you know how much I, and other people from whom you will never hear, appreciate your magazine.

Owing to my occupation as radio operator, I sometimes, but I am glad to say, rarely, have the misfortune to miss an issue of your book. Before that happens, though, I have visited all the hook-sellers in the vicinity.

There is only one thing that I do not care for in your book. And this is the same thing Mrs. L. Silberberg, quoted in your October issue, mentions.

The cover of AMAZING STORIES is too lurid for ordinary quiet people. I am not saying anything about Mr. Paul's pictures. They can only be described as "Wonderful." But this is the trouble. If I buy the book, immediately my friends see it they say, "A penny dreadful," "Blood and thunder" and similar remarks. I don't like to be thought of or described as a reader of penny dreadfuls. Nor do I like to hear the only magazine I have ever had a real interest in, described as "trash."

However, I have noticed that those people who give a significant grin when they see me reading the book with the "leud" cover, always come back to me for more once they have read a copy themselves. These are the people who appreciate the stories in the magazine, but who will not acknowledge it.

Several people have suggested that the magazine be named "Scientifiction." Why not? Is it not the true name of the work in the magazine? Are there not a hundred and one magazines in the United States whose name consists of two words, and the last word is "Stories"? Do any of those magazines come up to the standard of this journal? Do any of them have the type of story that is in this book? Therefore, why give such a commonplace name to such an uncommon book?

I will not comment on any of the stories, as I like them all. Once or twice I was disappointed because there was too much romance and not enough science, but those cases have been so rare that I cannot recall one to mind at the moment. Of your recent stories I consider "The Sunken World" and "The Menace" two exceptionally fine stories. The former reminds Jules Verne and H. G. Wells in mind.

Why people comment on the impossibilities, and possibilities of happenings in the stories, I do not know. For one thing, as is so often quoted, "What is fiction today may be fact tomorrow." For another thing, it is the circumstances that arise from impossible happenings, impossible circumstances, or impossible things that make the stories interesting and show the imagination of the author.

I think there is no reason to prolong this letter. Other people have written to you and write to you giving their views on the book, etc., and I see no necessity for me to write the same things over, but I thought I would urge that the cover be changed.

I trust that your magazine will always remain as interesting as it now is, and that the circulation will continue to increase.

H. V. Goord
12 Constantine Road, Hampstead,
London, England

(We have little to say in answer to this letter, which is of interest as expressing views of an English reader. You are not the only person who wishes the name changed, but the magazine has made so many friends under that title, that the change seems inadvisable. As for impossibilities, it would be a great mistake to exclude them from our pages. You put it very well in your letter.—EDITOR)



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THE MAKE-UP OF AMAZING STORIES—ITS ILLUSTRATIONS—POE—AND WELLS OTHER AUTHORS NOTED

Editor, AMAZING STORIES:

I am a newdealer in London (Ontario), and I have always made it a practice never to read magazines, until I happened to get into conversation with one of my regular customers of AMAZING STORIES. He opened my eyes to the wonderful stories contained therein and rather skeptically I read my first copy. That was two years ago, and from that day to this I have never missed one copy of your publication. I must congratulate you upon the general make-up of your Monthlies, Quarterlies and Annals. To my mind there is nothing to be desired either in the type of binding or the paper used, and would urge you to keep it exactly as it is, distinctive and original.

I will, if you will permit me, make a few general observations. The illustrations by Paul are remarkably good and exact in almost every detail, he certainly is adapted to Scientific illustration and helps to convey an accurate idea of the author's scientific theories.

I enjoy your reviews and believe that you have just about the right number in proportion to your other stories. But why not more of Poe? To my mind, Poe is the genius and the inventive mind that first brought Scientificism into being. He is greater than all your other marvelous writers and I must confess that it was really his name that made me actually read AMAZING STORIES. Would it be too much to ask for at least one more of his stories in the not far distant future?

I understand that H. G. Wells is liked and read by a great many people, and as such of course he must find a place in your magazine, but as to my own personal opinion, please excuse this, I think he is absolutely unreadable. When I found him in AMAZING STORIES I made a few feeble attempts to digest his work and then left him entirely alone. I fail to find any real depth to Wells. His "War of the Worlds" left me completely mixed up with the questions continually recurring: Why did all the Martians land in little England? Why did so many people and governments stand idly by their mouths open, as it were, without taking any worthwhile measures? Why belittle the clergy? etc., etc. Still, what is the use? I'll just leave him to those who can appreciate him.

Keller, Verill, A. Merritt and Baron Minchenhausen are real good and I enjoy all their stories together with all your other authors' work. I do not think I could really criticize any of them. Still, some of your stories would be better appreciated if romance was separated from scientific fiction. I realize that there are certain cases where the two sexes must be introduced in order to work out a sound scientific principle, for instance, The "Sub-Universes" and "Moon of Doom" but surely not in "The 'Sunken World'." These are only suggestions, however, and not intended for brickbats.

Since becoming converted to AMAZING STORIES I have done all in my power to spread the gospel of Scientificism. I have obtained several new customers in London, Ont. for you and have also obtained many new readers by lending and then returning my old copies of AMAZING STORIES. I must thank you for giving me many pleasant hours of enjoyment during the past two years, and wish you the best of success in the future.

J. Gibson
619 Richmond St.
London, Ont., Canada

(Your letter approving of our humble efforts is welcome. It is hard to please the public, and we are rather surprised how much commendation we have received. We will keep Edgar Allan Poe in mind, but there are few of his stories that are now adapted to our pages. Many of them of a scientific basis take the form of psychology. The author of the "War of the Worlds" has achieved a high reputation, but we think that some of our authors are in many ways. We highly appreciate your good wishes.—EDITOR.)



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PAUL'S ILLUSTRATIONS; CRITICS COMMENTED ON: PRONUNCIATION OF SCIENTIFIC TERMS

Editor, AMAZING STORIES:

Although I am writing this to criticize, yet I hope that my remarks will be of a constructive nature. I have assiduously read and studied your stories for a sufficient time to be in a minor way capable of expressing an intelligent opinion.

I have given much thought to the illustrations and the style of cover which has received such a deluge of burning and specious criticism. It is impossible to find one thing which will please the multitude. Criticism is the bane of the modern literature. AMAZING STORIES contains the most unusual type of fiction that is published in the United States today. Is it not all in the line of good policy that the illustrations should be as extravagant and apparently preposterous as the stories which they illustrate?

Should the present policy of the magazine be deviated from and a less flamboyant type of art be substituted, there would be innumerable objection from innumerable readers who read only for a pastime. It is altogether fitting and proper that the readers should find fault, but I am sure that there should be no such foolish criticism as has been published in regard to the cover illustrations, etc. For myself, I think that Paul is a wonderful artist and if I could be assured that it would never reach his ears, I would say that there is a bit of poet somewhere in his make-up. No one but a poet could live and support such a weird and active imagination as his.

As for the stories, I wish to add my suggestion to the multitude. There are a fine reception for a few paleontological tales. We are all interested in this type of story.

Now, for a suggestion which I am sure will meet with acclaim and approval from many and action which could require very little space in the magazine. Why not give us a self-pronouncing supplement. There are many words used in identification with which the average reader is not familiar, and doesn't he have to pronounce.

HARRY ALONZO BARNES,
40 Oak St.,
Battle Creek, Mich.

(We are glad that you approve of the type of illustrations which we employ. We consider that they are properly used in the magazine, and that we are proud of them. We will have to show Mr. Paul what you write about him. We have had some very fine tales of old time geologic ages, some very impressive ones introducing saurians and life of the prehistoric world. See in general a new story, "The Sixth Glacier." We give very few words which need the pronunciation explained, but we will bear in mind what you say.—Editor.)

A VIGOROUS CRITICISM OF SOME OF OUR MOST POPULAR STORIES

Editor, AMAZING STORIES:

It is far from my purpose to condemn your selection of stories in this unique publication, for a glance through the "Discussions" page demonstrates the reason for the choice which occupies many of the columns of each issue, for popular appreciation and enjoyment proceeds in inverse proportion to the literary merit of each fanciful creation. And you certainly must subscribe to the demands of the larger and less discriminating portion of your clientele, otherwise no circulation.

As a classic exercise, may I call your attention to the decantings of one A. Merritt. Surely the superficial bombast of his glittering and gaudy wordiness must be painful to others, as well as to me. The "Moon Pool" was a source of real grief for me, in all my reading, have I sat on the reviewing staff before such a wearisome procession of chocolate-and honey-dipped expressions. My mind fairly reeled at the gay colors and weird scenes that were so vague as to be grotesque. But in spite of the platitudinous ponderosity characterizing his verbose latherdash, Mr. Merritt has some really good ideas. His satire on humanity is often keen, and his criticism of the scientific world is a book with real anticipation for his sequel to "The Face in the Abyss."

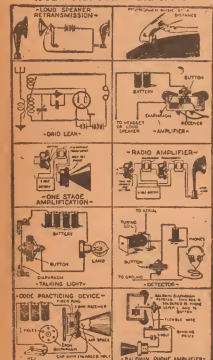
Oh yes, fourth dimension. Every one else writes on that most discussed subject, why not I? Now if time must be harnessed into location and activity, why impose on it the word "dimension"? Messrs. Einstein and Poor are sound enough, but their terminology is subject to grave question. Any word comes to have its meaning through use. "Dimension" has always been used to indicate length, breadth and height, or thickness. When we saddle time, which is measured differently, and has a different function,

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to the old idea, we run in danger of creating a grave misunderstanding. This is, indeed, the case. A new word should be coined to indicate time as an extension of dimensional activity.

Other "fourth-dimensional stories" are absurd. Even a theoretical two-dimensional plane has no mass, for the thickness of a millionth part of an atom would yield a third dimension—and mass. (How about a shadow? a perfect two dimensional plane?) —LATTON.) Now some of your authors would lead us to believe that when a three-dimensional object is projected into the fourth dimension, it suffers a sad relapse into two-dimensional characteristics, i. e., no mass. Is it any wonder that the descriptions of the mechanisms producing this remarkable result are painfully obscure?

Mr. Paul is a remarkably apt illustrator, especially considering the manuscripts with which he is obliged to work. However, in a diagram of a head or forehead is indicative of one of two things, undeveloped half-brain, or a morose condition. Eyes that are too bright often mark a lunatic. Perhaps Mr. Paul's indulging in a delicate satire at the expense of your writers in portraying the intellectual (?) character of the activities of these leading men.

May I bluntly say that the use of profane utterances in the stories is entirely unnecessary, and, to me at least, most objectionable? May I ask that you request your writers to omit the superfluous expletives.

My sympathy is all with those who are asking for a new name for the magazine. The present one smacks too much of the vulgarly sensational, and causes many people to classify AMAZING STORIES with the purist stream that is defiling our news-stands. A high grade of paper will do still more to dispel the stigma under which the magazine, to my very certain knowledge, rests.

A classic contribution might be made to your periodical if some intensely practical author could contrive to write a tale of a strange class of mortals who create uncanny and amazing stories—mortals who think with their feet.

Are't there any homely women anywhere in the universe except here on earth? Why must we, of all the creatures in the universe, gaze upon such faces?

P. H. WOOD,
13 E. Fountain Ave.,
Delaware, Ohio.

(We feel that in publishing this rather eloquent letter, we prove that we do not hesitate at printing today's readers in that our readers are the very things you condemn. Since our magazine's first issue we have studied our readers' desires, and they are widely different from yours.—EDITOR.)

COMMENT ON WELLS AND CRITICISM OF SOME OF MRS. HARRIS' WORK

Editor, AMAZING STORIES:

After reading your April issue from cover to cover, I thought I would send in a letter of comment. I never before liked H. G. Wells' stories, but after reading his story of the days to come, I was forced to change my opinion. I think that considering the time when he wrote his story, it is very prophetic about what may come to pass. I think that Harley S. Aldinger will become a very popular author, that is, if he changes his style of writing slightly. Aldinger's stories should have a little human interest besides just facts. Your story "The Yeast Men" is very interesting and contains a modicum of facts. I have been reading Baron Muenchhausen's adventures without enthusiasm. You mentioned in commenting on a letter of criticism that nobody had caught on to T. M. Alier. The name is too simple to admit of comment. Even a child would understand that it is intended to criticize his veracity. I like Mrs. Harris' story very much, but at the end of the narration, she mentions the hero finding a beetle, after all of the insects on the earth had been killed off; I do not understand how it got there, unless by spontaneous generation, which has been disproven. She also says that people began to plant things again with the package of seeds that Nathano found, but does not mention how after the first crop, the plants were fertilized. I like this were done by human agency, otherwise insects are required for this. I will pass over the other stories and ask any of the readers of AMAZING STORIES who are interested in founding a Science Club to write me giving me their views and ideas on the subject. I am very much interested in this project and think it would be a very great help to the youth of the World.

GEORGE LASKY,
540 W. 122nd Street, New York City.
(Very few people have intimated that they understood the origin of Mr. Alier's name in the Baron Muenchhausen story. Your criticism of Mrs. Harris will be read by her and we hope that she will answer. In any case, we prefer to leave that task to her.—EDITOR.)



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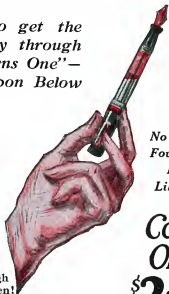
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